US009474417B1

(12) **United States Patent**
Pryor, Jr. et al.

(10) **Patent No.: US 9,474,417 B1**
(45) **Date of Patent: Oct. 25, 2016**

(54) **AUTOMATED MIX IN-CUP APPARATUS**

(71) Applicant: **Hamilton Beach Brands, Inc.**, Glen Allen, VA (US)

(72) Inventors: **Ernest B Pryor, Jr.**, Maidens, VA (US); **Benjamin H Branson, III**, Mechanicsville, VA (US); **Brian P Williams**, Midlothian, VA (US); **James Robert Gaynor**, Richmond, VA (US)

(73) Assignee: **Hamilton Beach Brands, Inc.**, Glen Allen, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/209,884**

(22) Filed: **Jul. 14, 2016**

Related U.S. Application Data

(60) Continuation-in-part of application No. 15/007,948, filed on Jan. 27, 2016, now Pat. No. 9,415,358, which is a continuation of application No. 14/595,558, filed on Jan. 13, 2015, now Pat. No. 9,272,250, which is a continuation of application No. 14/323,272, filed on Jul. 3, 2014, now Pat. No. 8,950,931, which is a division of application No. 12/901,636, filed on Oct. 11, 2010, now Pat. No. 8,807,823.

(51) **Int. Cl.**
A47J 43/044 (2006.01)

(52) **U.S. Cl.**
CPC *A47J 43/044* (2013.01)

(58) **Field of Classification Search**
CPC A47J 2043/04472
USPC 366/200, 201
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,977,419	A *	10/1934	Adams et al.	A47J 43/044 366/200
2,552,054	A *	5/1951	Misic	A47J 43/044 248/178.1
5,328,263	A *	7/1994	Neilson	B01F 7/161 366/254
2008/0279040	A1 *	11/2008	Neilson	B01F 7/1605 366/176.1

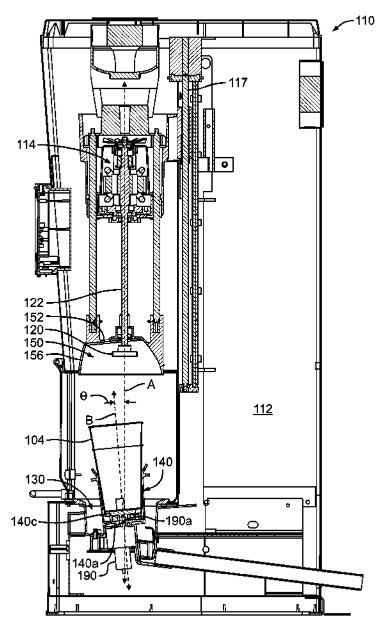
* cited by examiner

Primary Examiner — David Sorkin
(74) *Attorney, Agent, or Firm* — Alexander D. Raring

(57) **ABSTRACT**

An automated mix in-cup apparatus includes a frame having a cup-holder to secure a tapered cup selectively placed therein, and a first motor operatively connected to the cup-holder to rotate the cup-holder. A reciprocating carriage is axially supported by the frame and supports a second motor and a rotatable mixing blade to mix a consumable material. The mixing blade is secured to a shaft axially extending from the second motor, the shaft defining a longitudinal axis and the second motor configured to rotate the shaft and the mixing blade. Reciprocal movement of the carriage axially translates the mixing blade into and out of the tapered cup in the cup-holder. The cup-holder and the first motor are oriented at an incline, defining a tilt angle relative to the longitudinal axis of the shaft, whereby the shaft and the rotatable blade are positioned off-center relative to the tapered cup in the cup-holder.

10 Claims, 21 Drawing Sheets



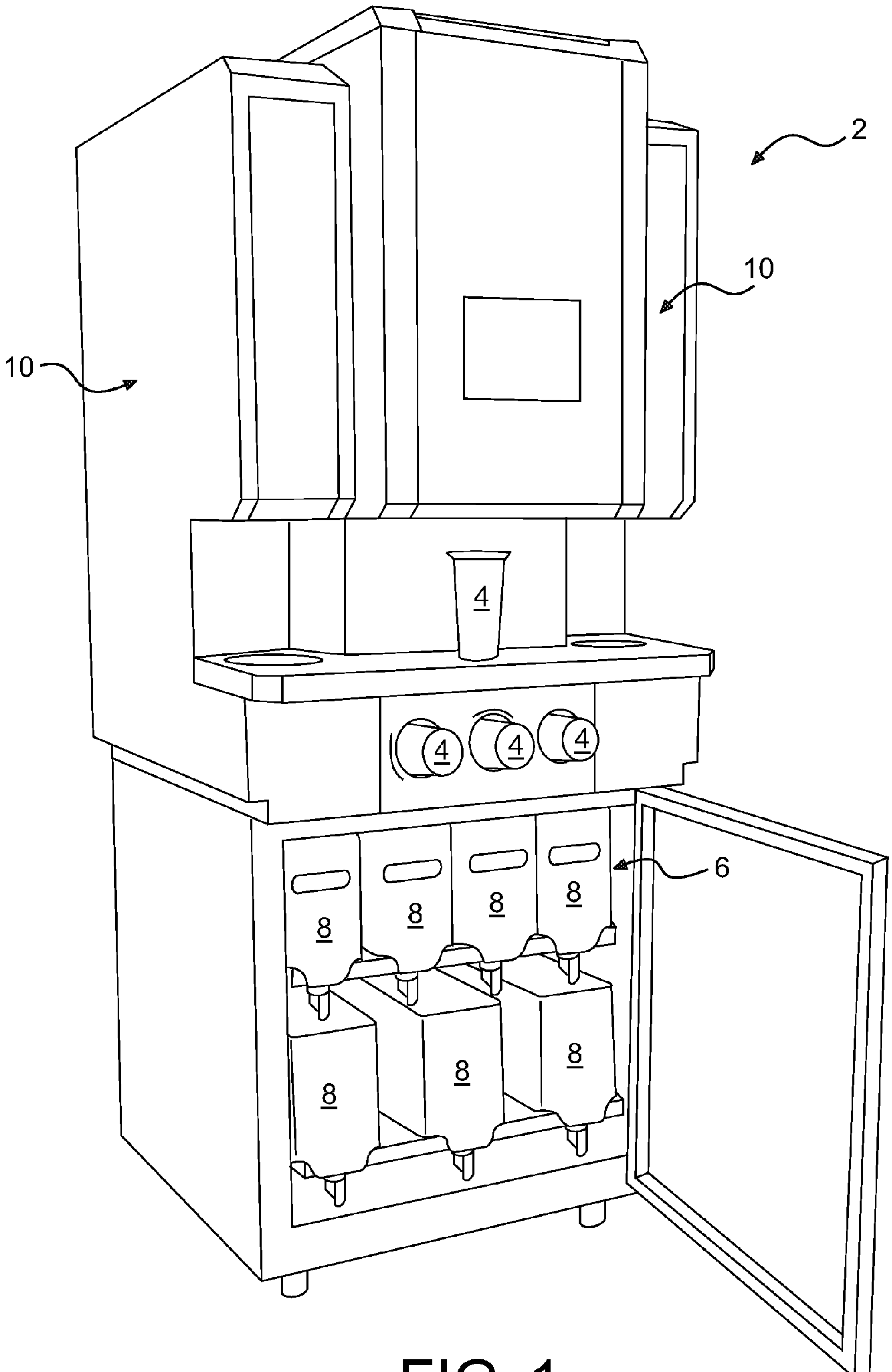


FIG. 1

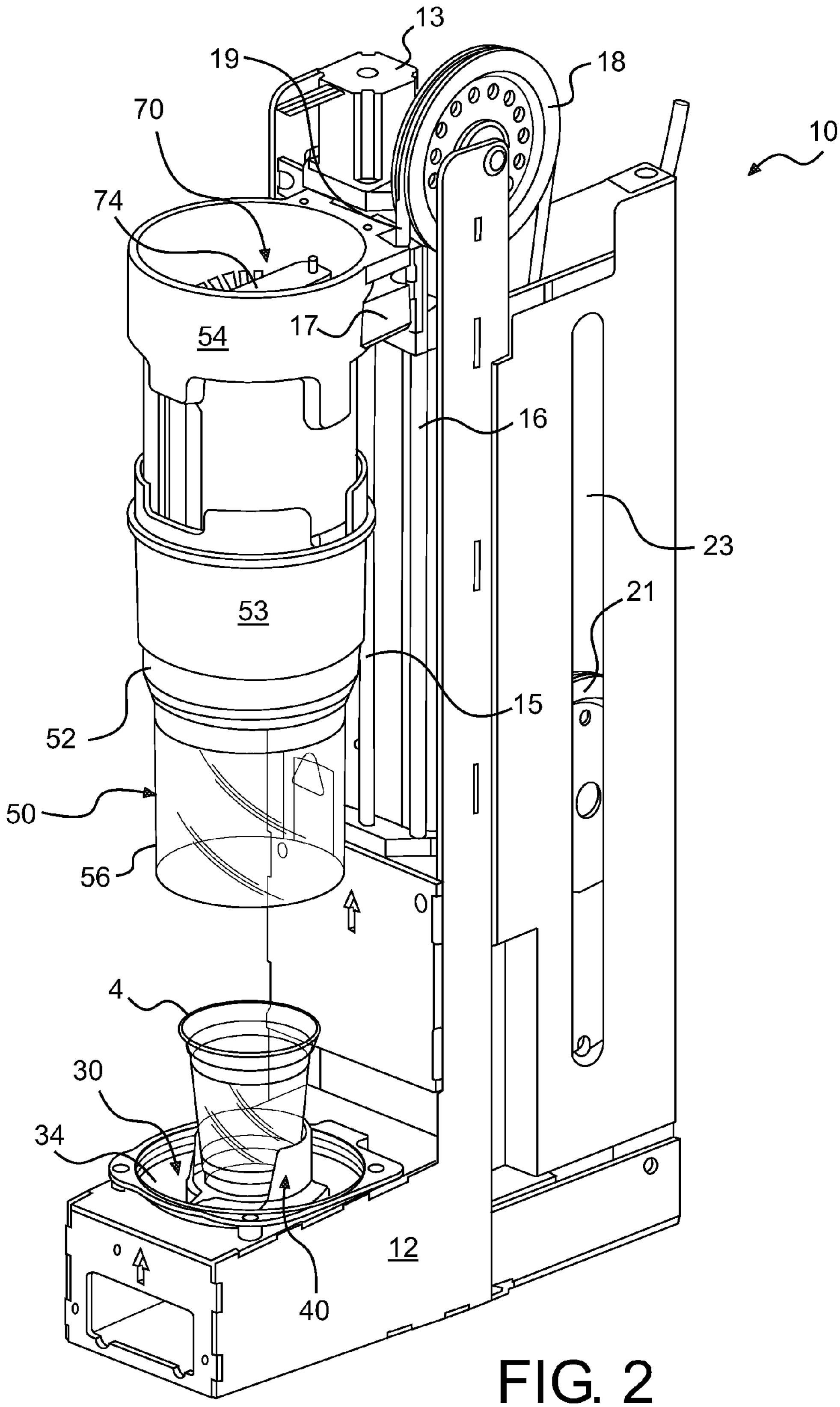


FIG. 2

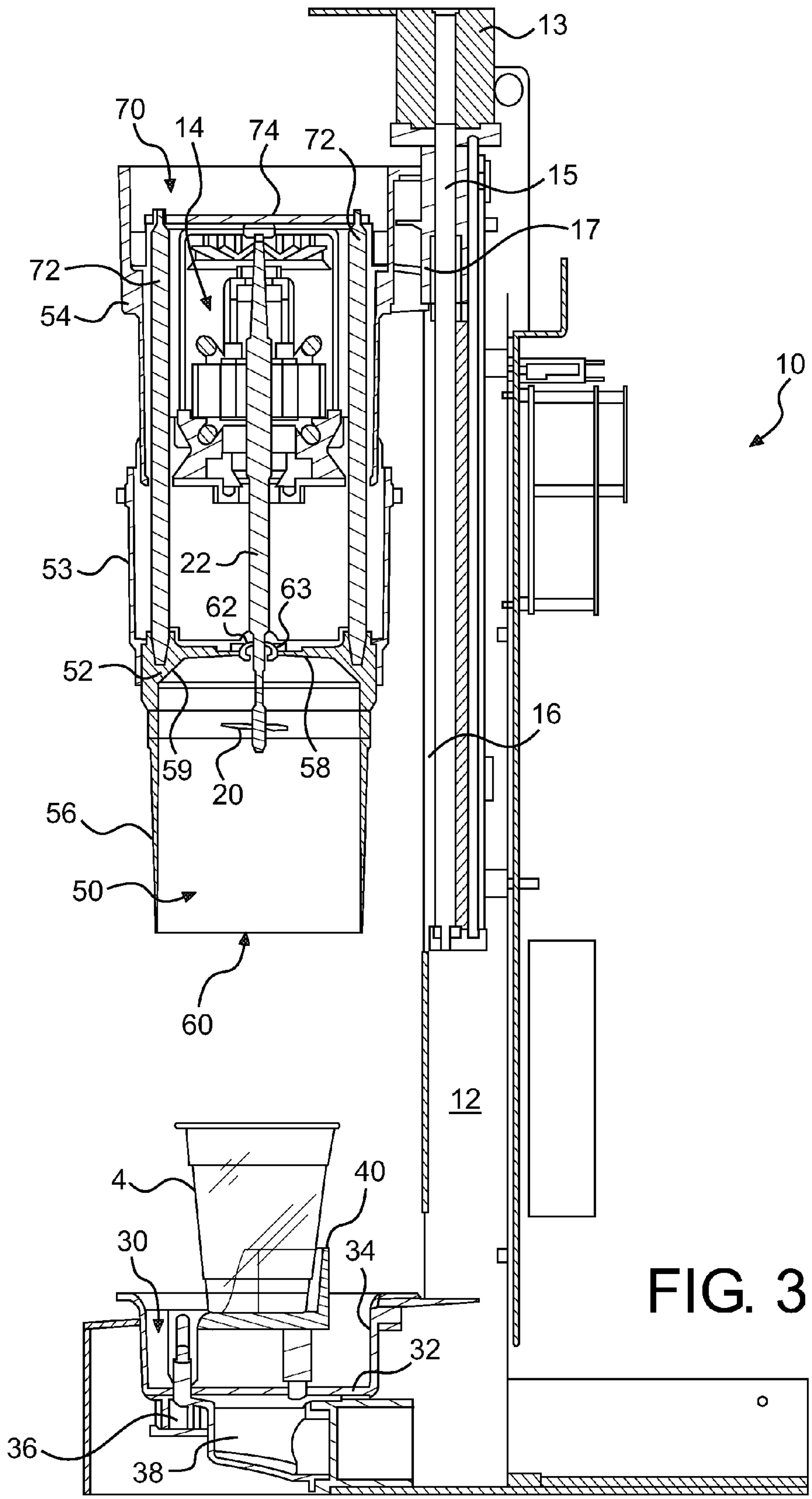

13
70
14
74
72
15
17
72
54
10
53
22
62
63
52
16
59
58
20
56
50
60
12
4
40
30
34
32
36
38

FIG. 3

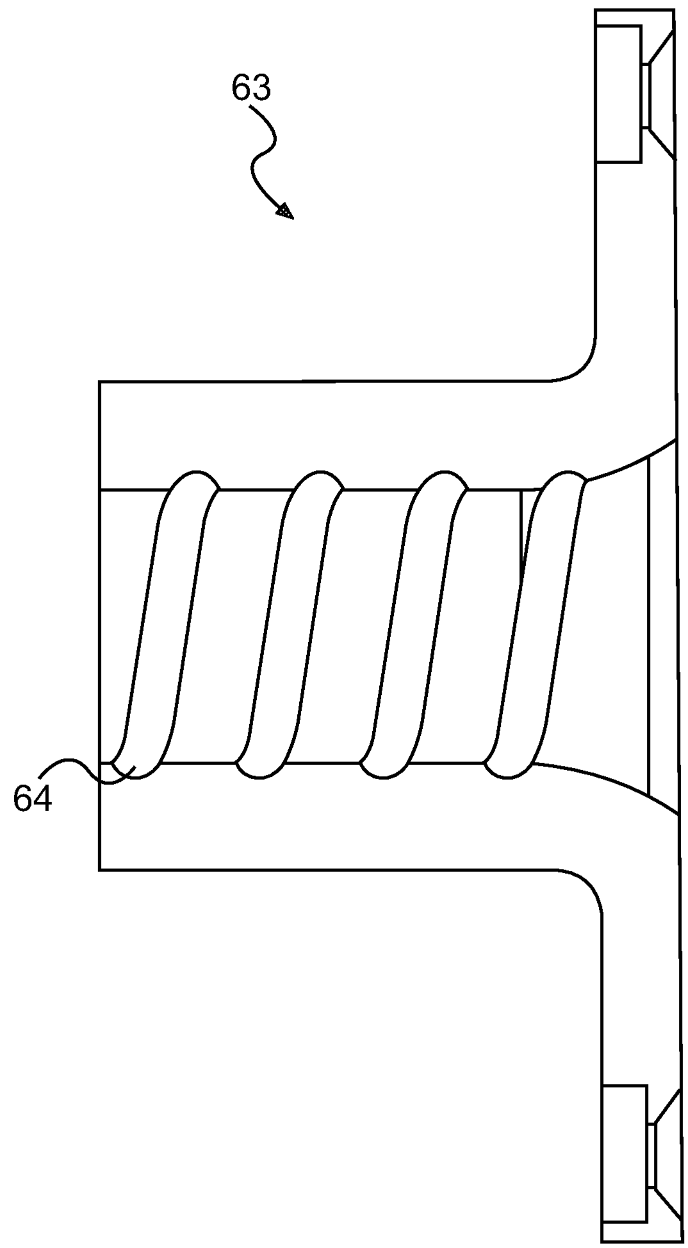


FIG. 3A

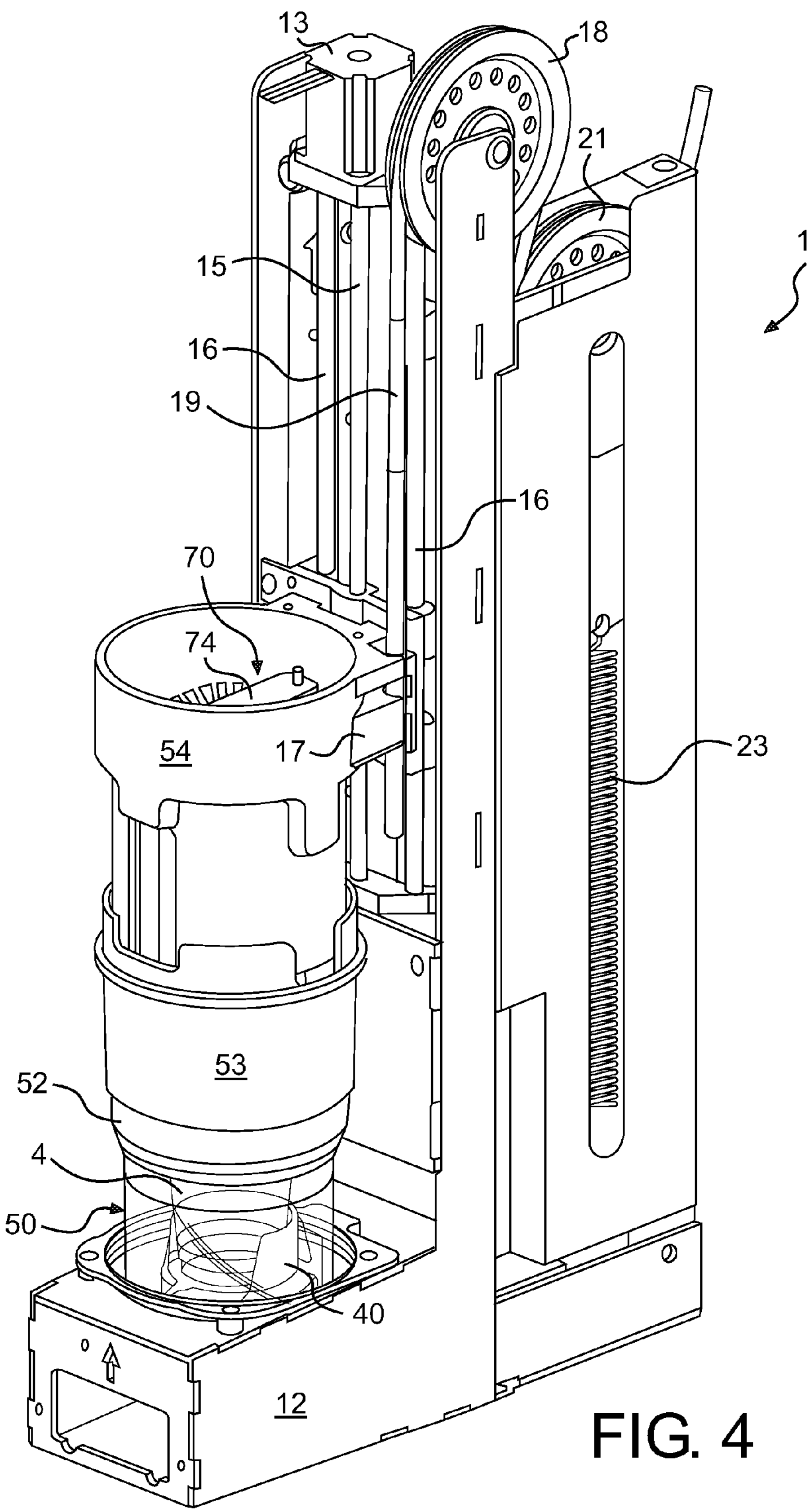


FIG. 4

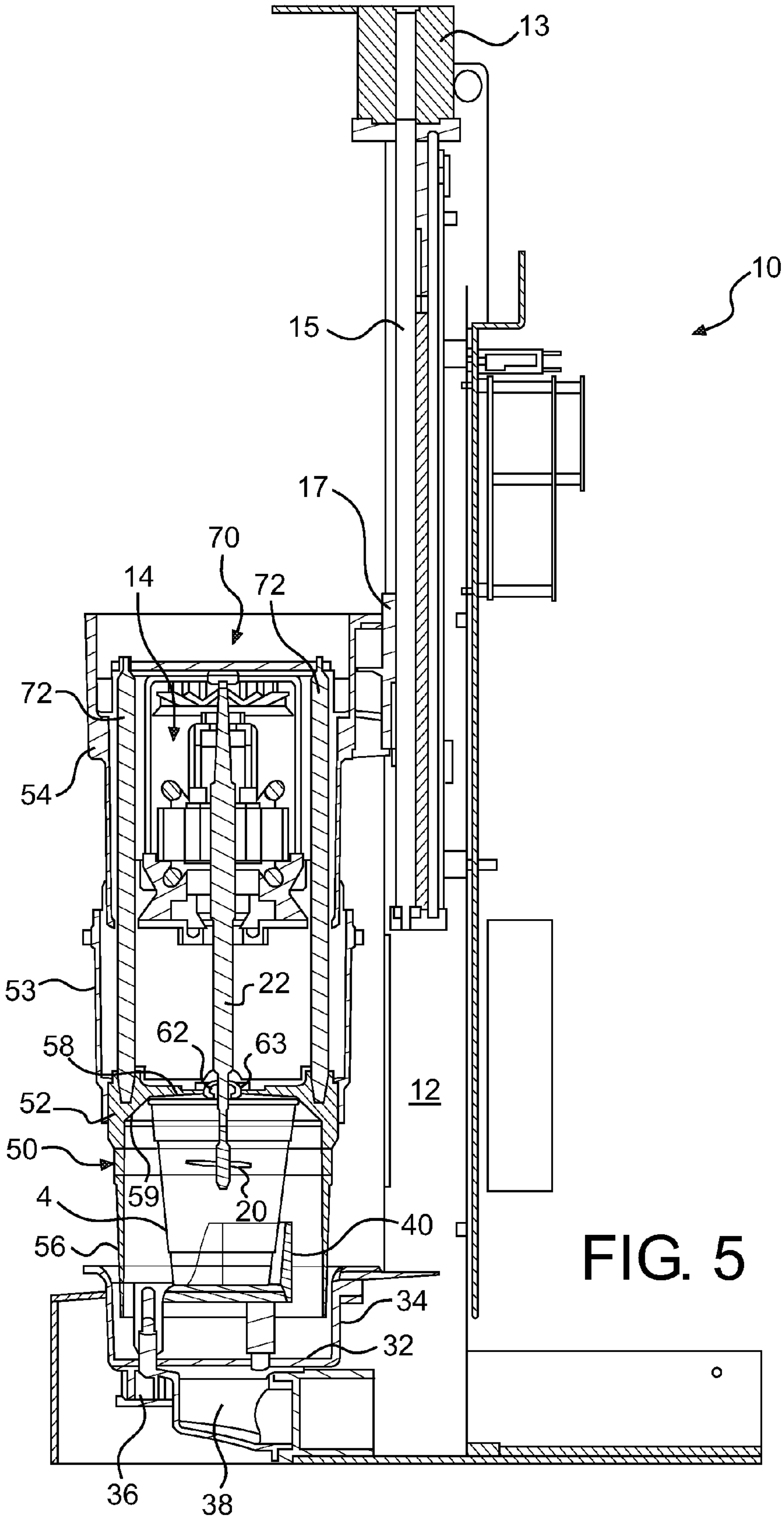

13
10
15
17
70
14
72
72
54
53
22
62
63
58
52
12
50
59
20
4
40
56
34
32
36
38

FIG. 5

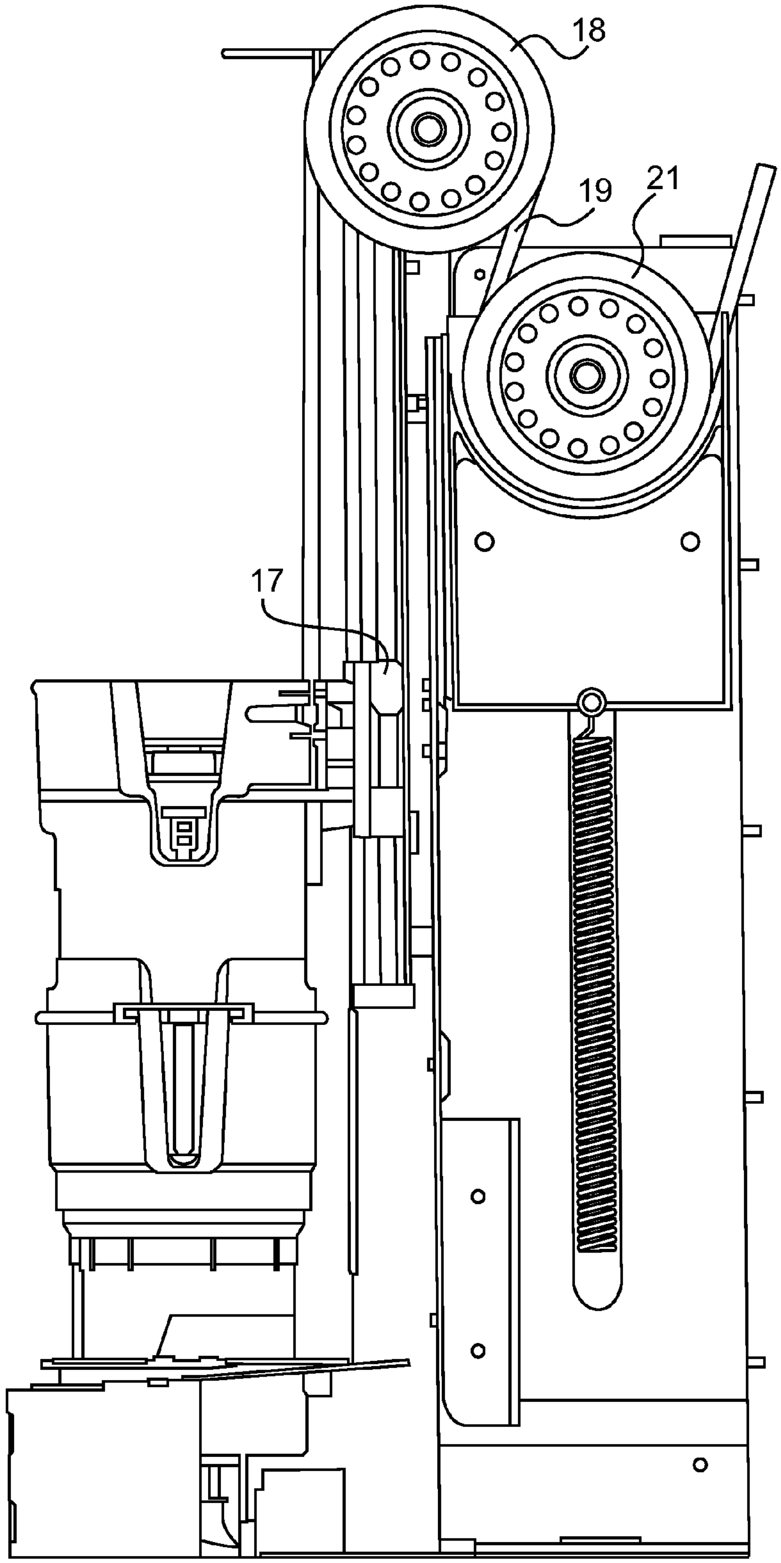


FIG. 5A

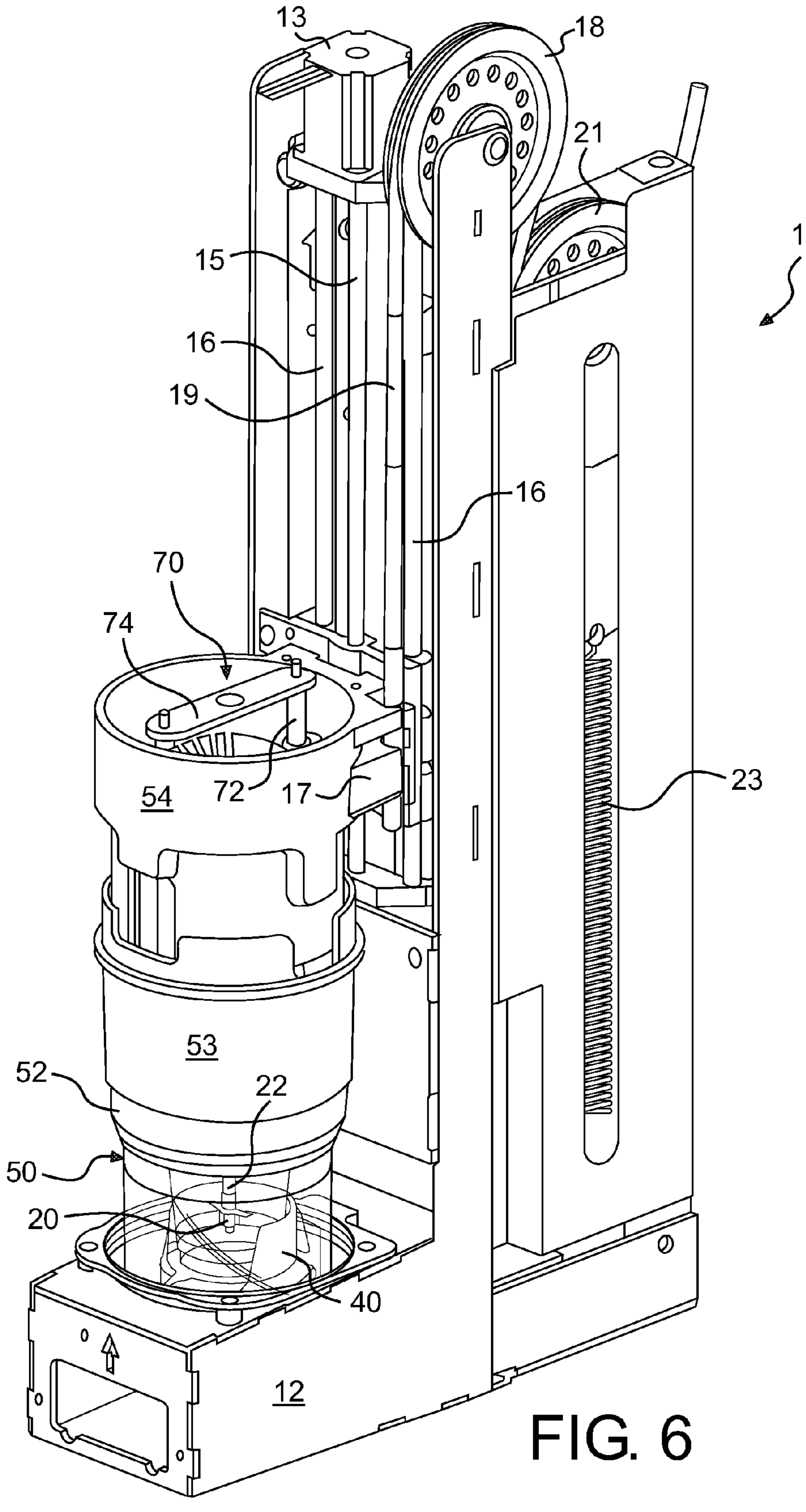


FIG. 6

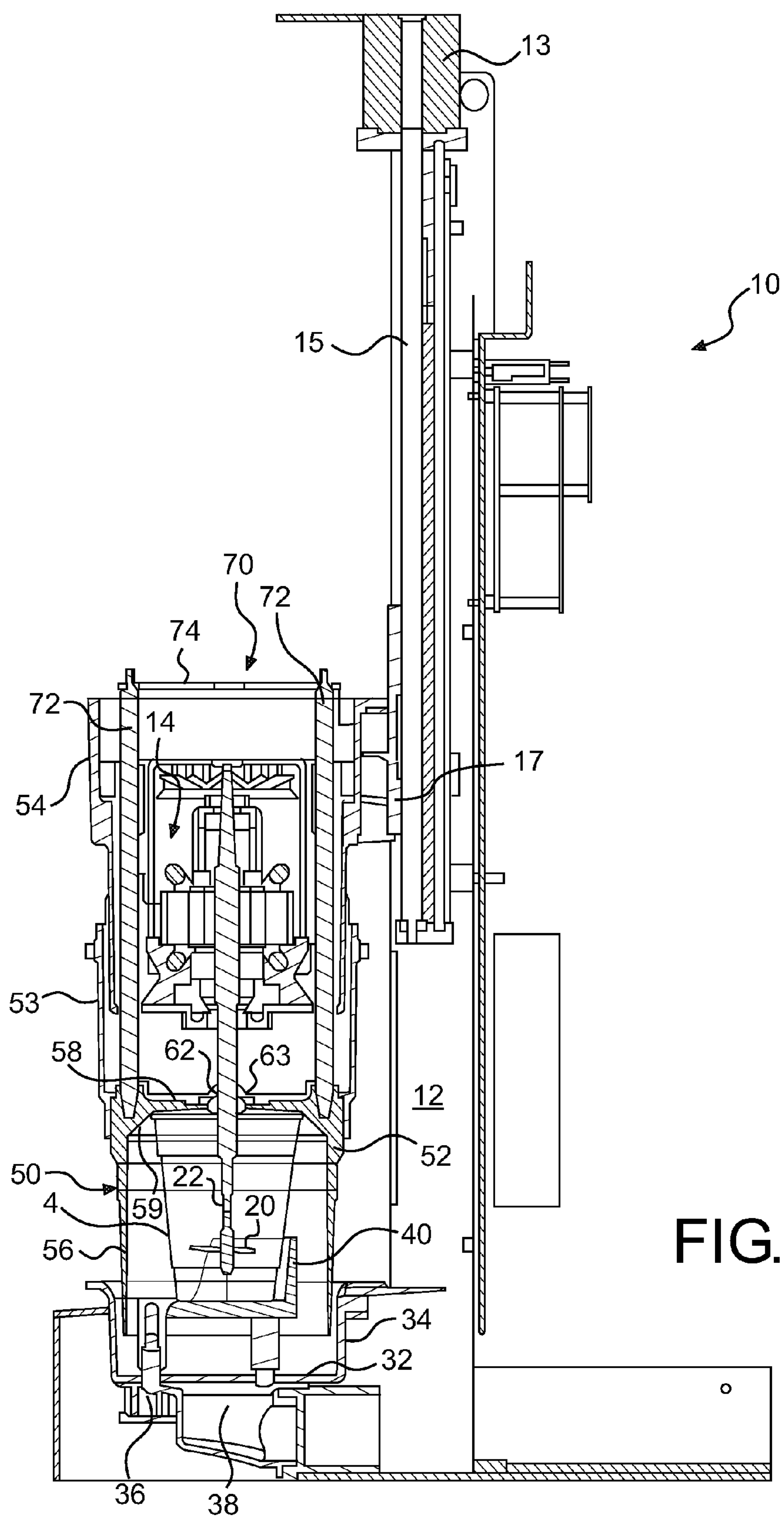

13
10
15
70
72
74
72
14
17
54
53
58
62
63
12
52
50
22
4
59
20
40
56
34
32
36
38

FIG. 7

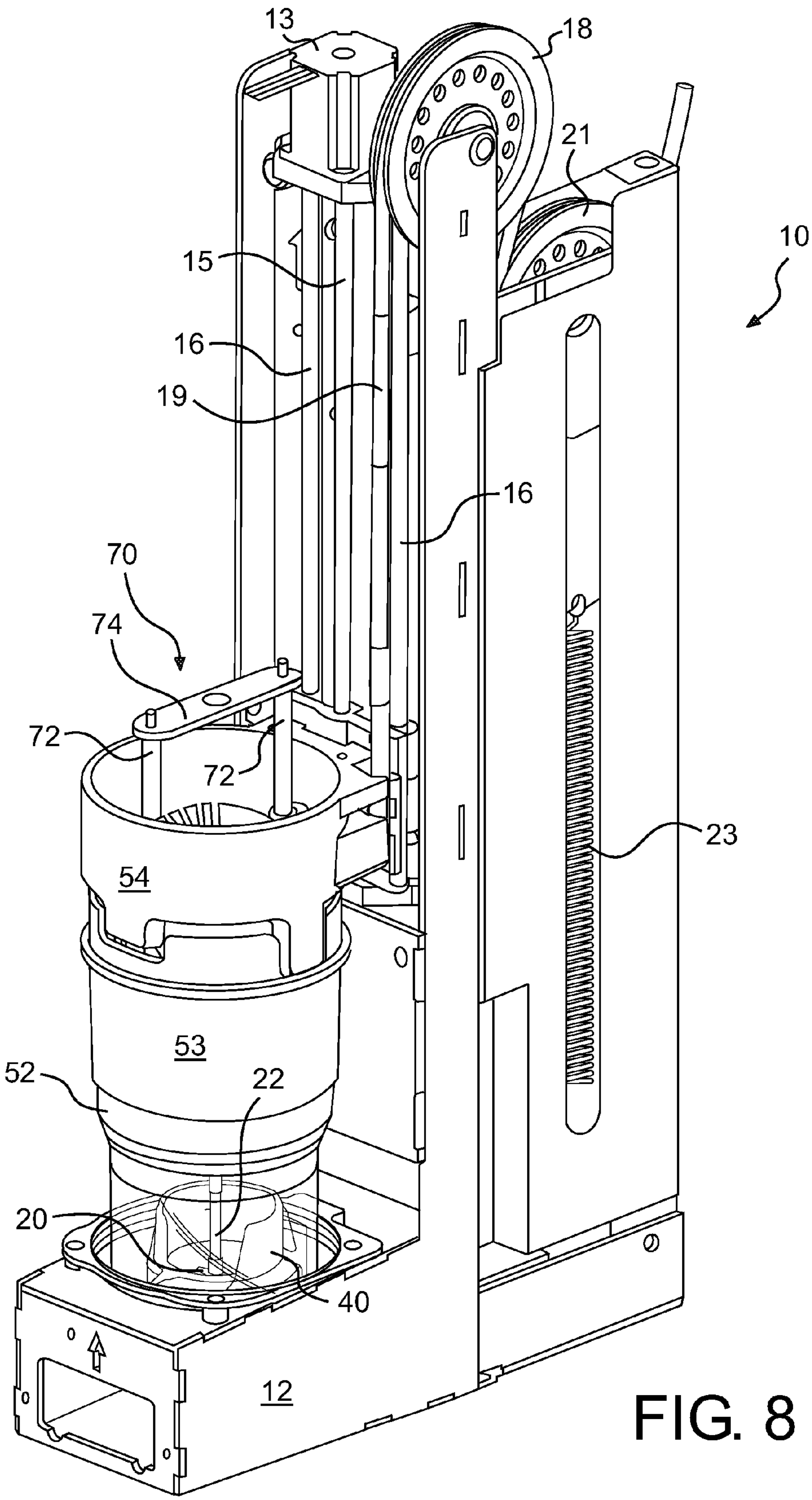


FIG. 8

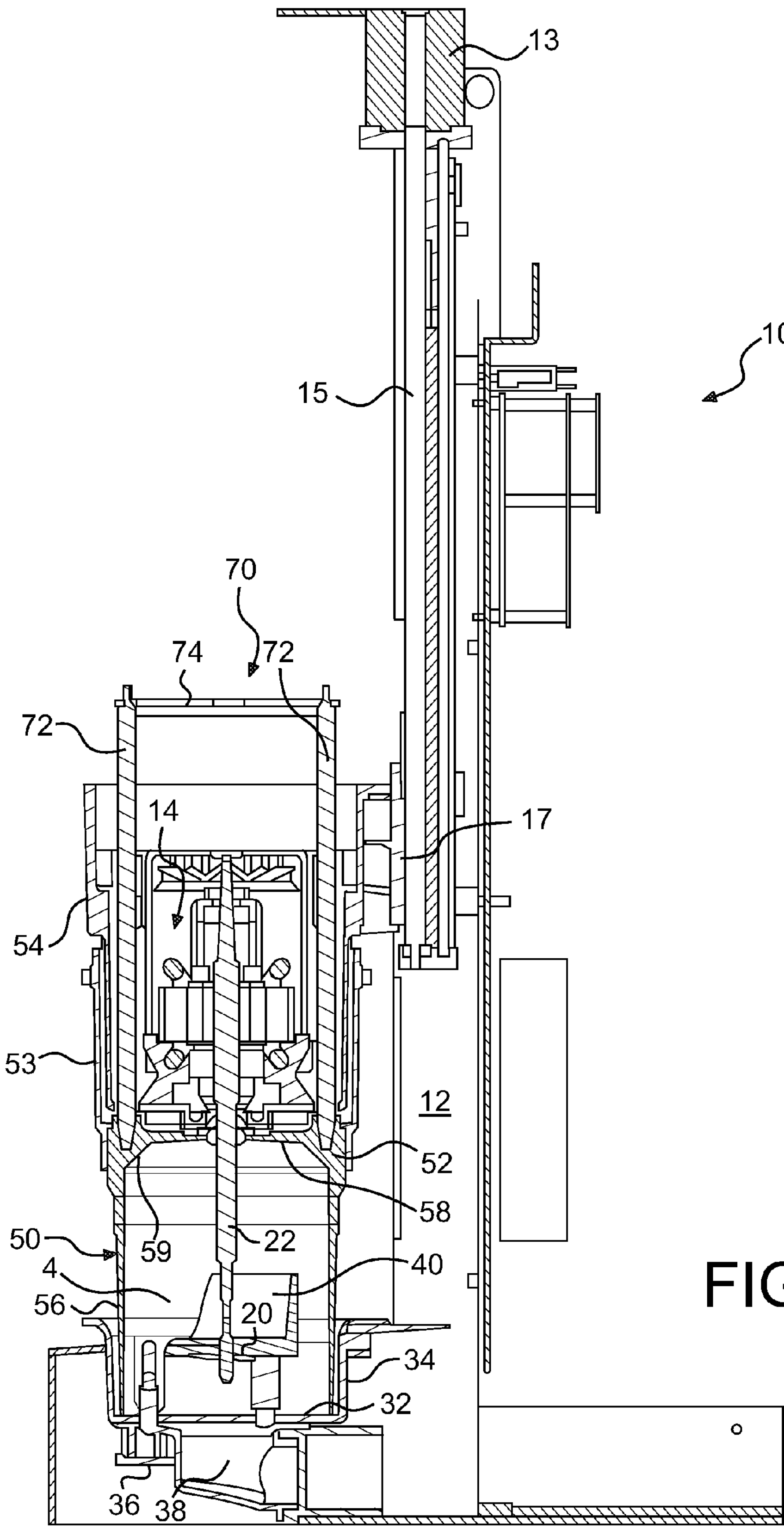


FIG. 9

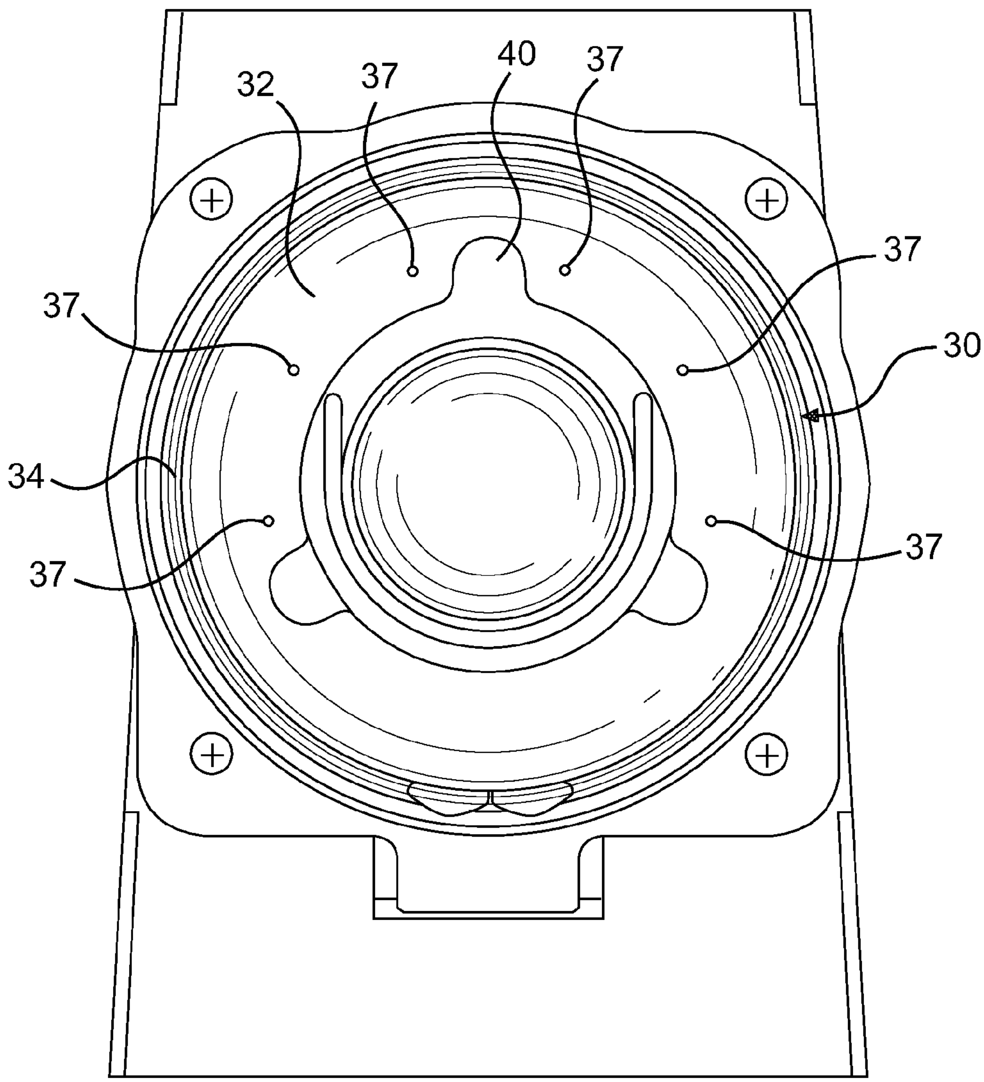


FIG. 10

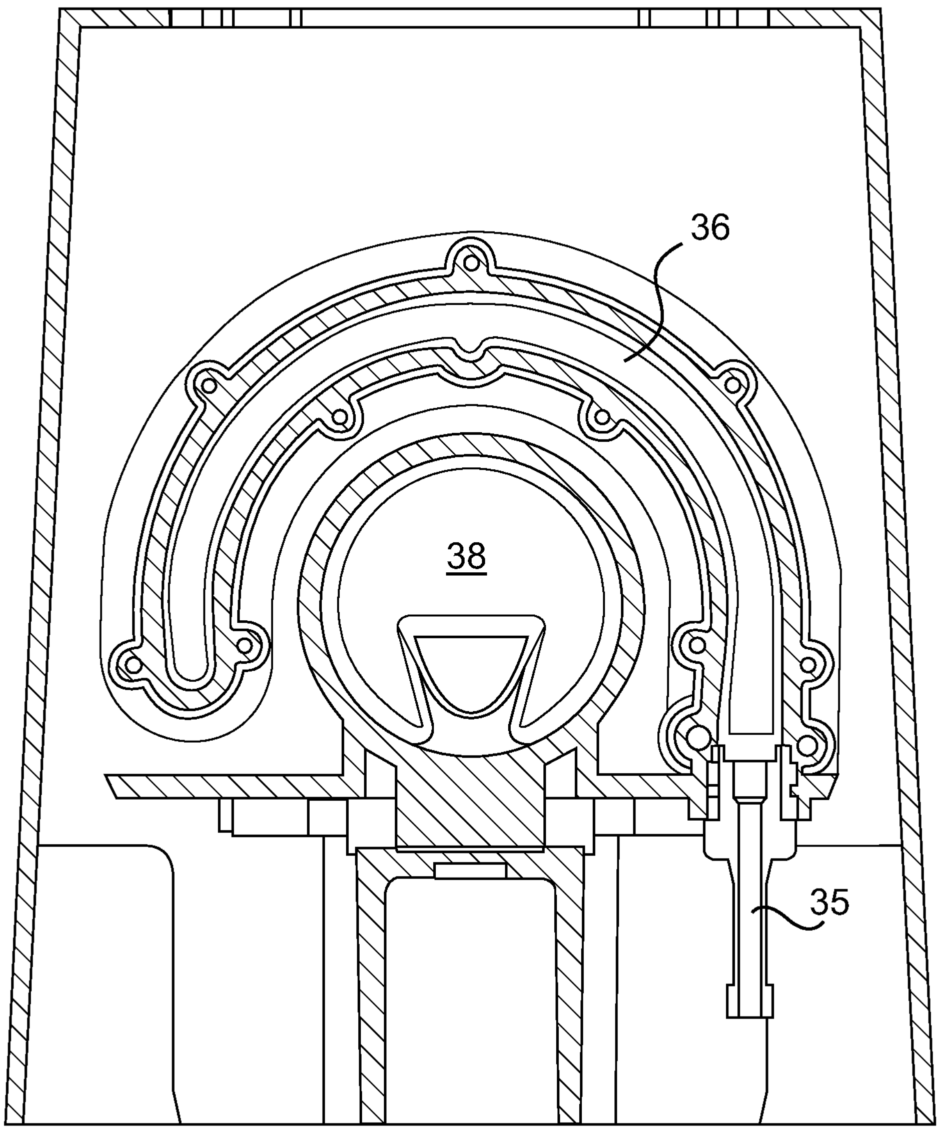


FIG. 11

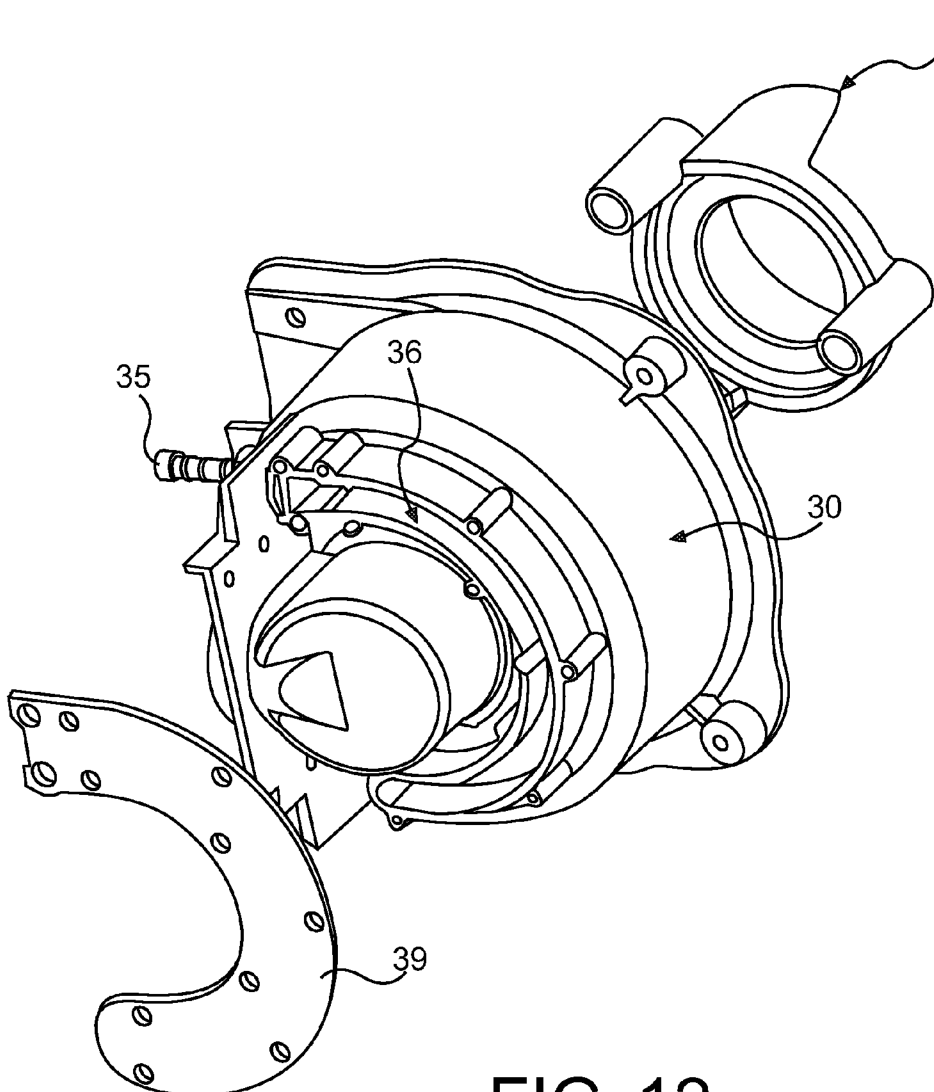


FIG. 12

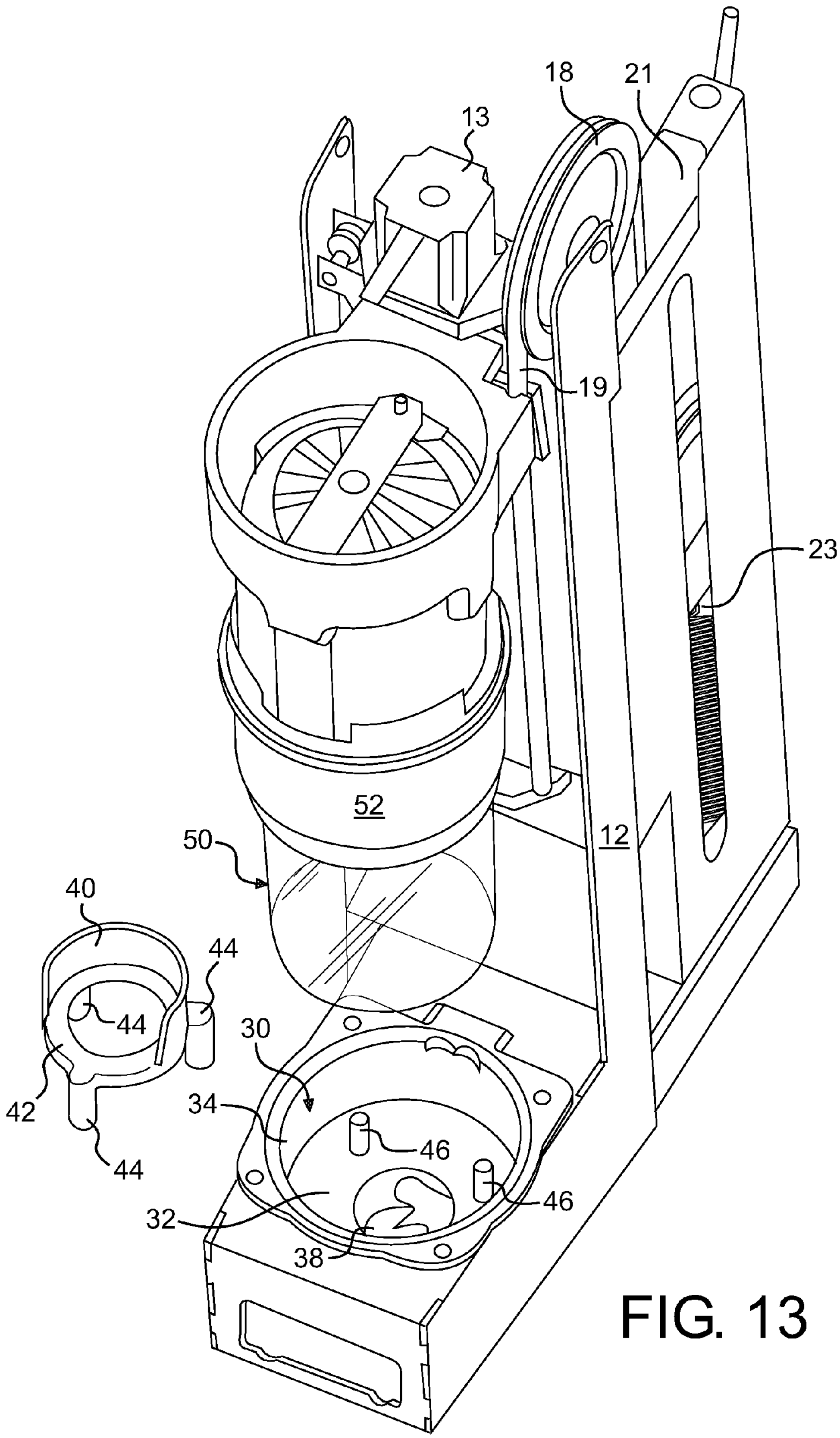


FIG. 13

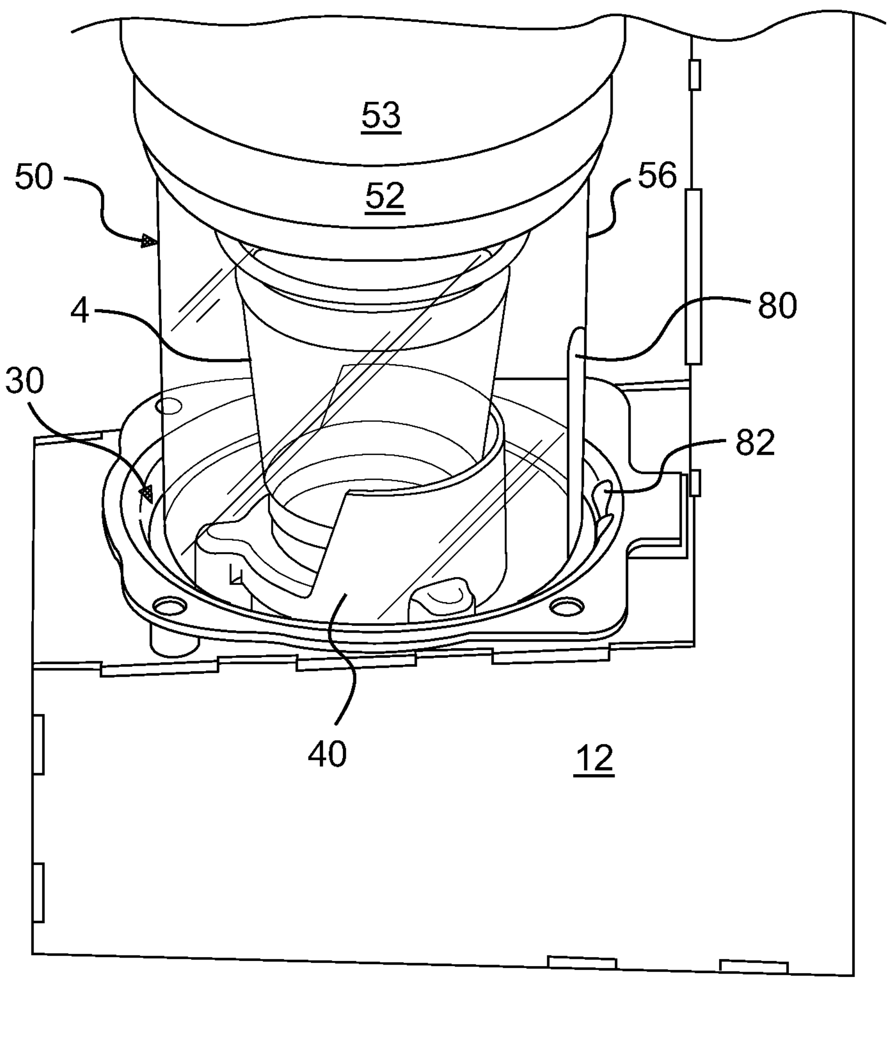


FIG. 14

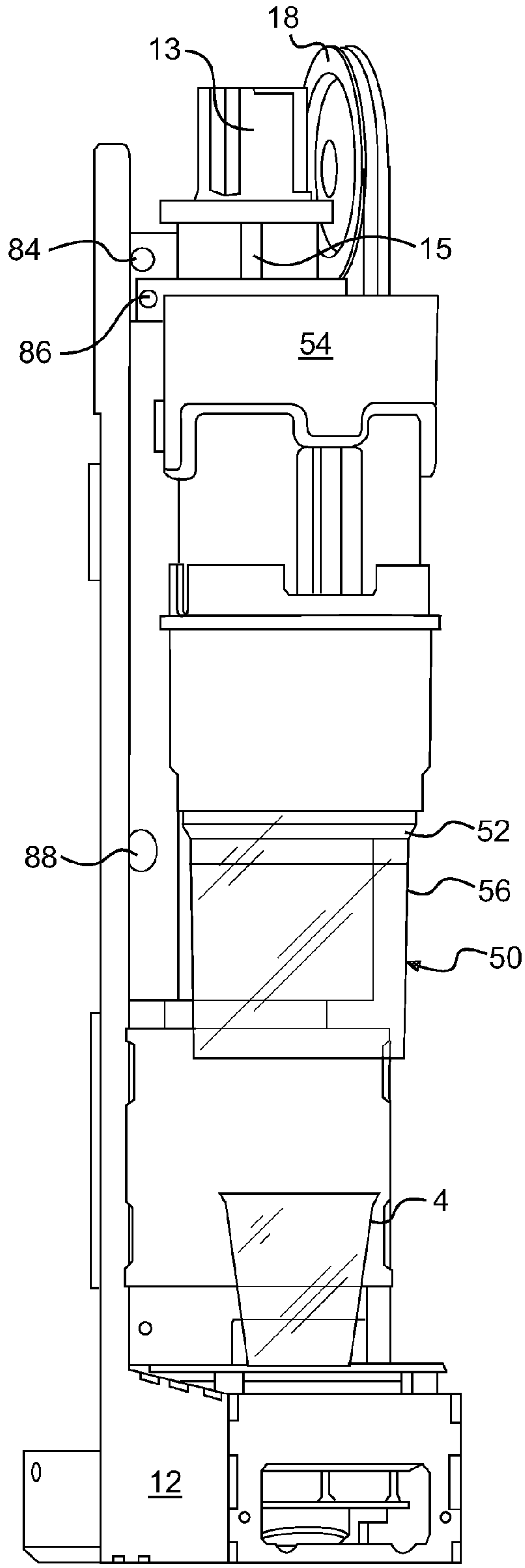


FIG. 15

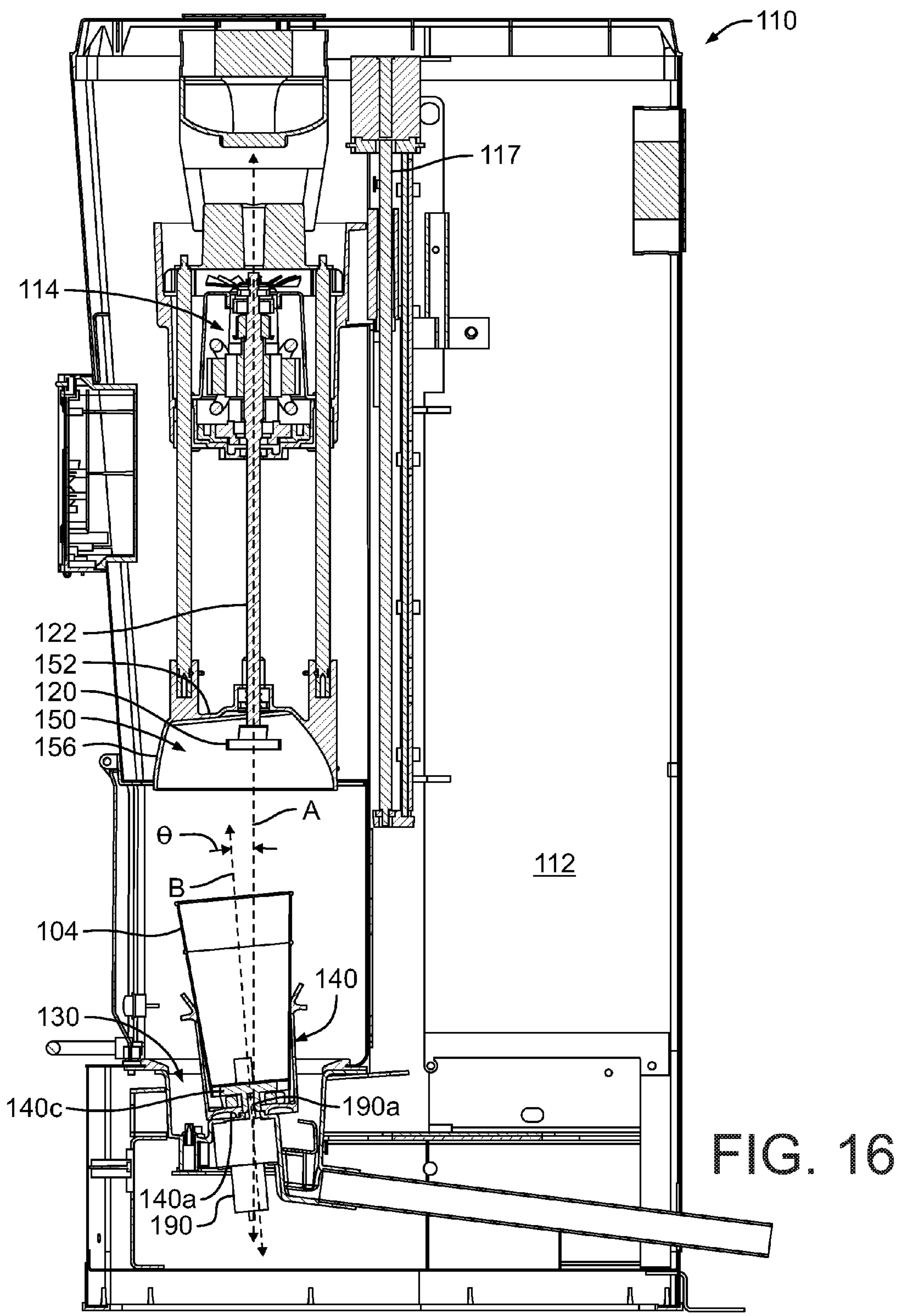

110
117
114
122
152
120
150
156
A
θ
B
112
104
140
130
140c
190a
140a
190

FIG. 16

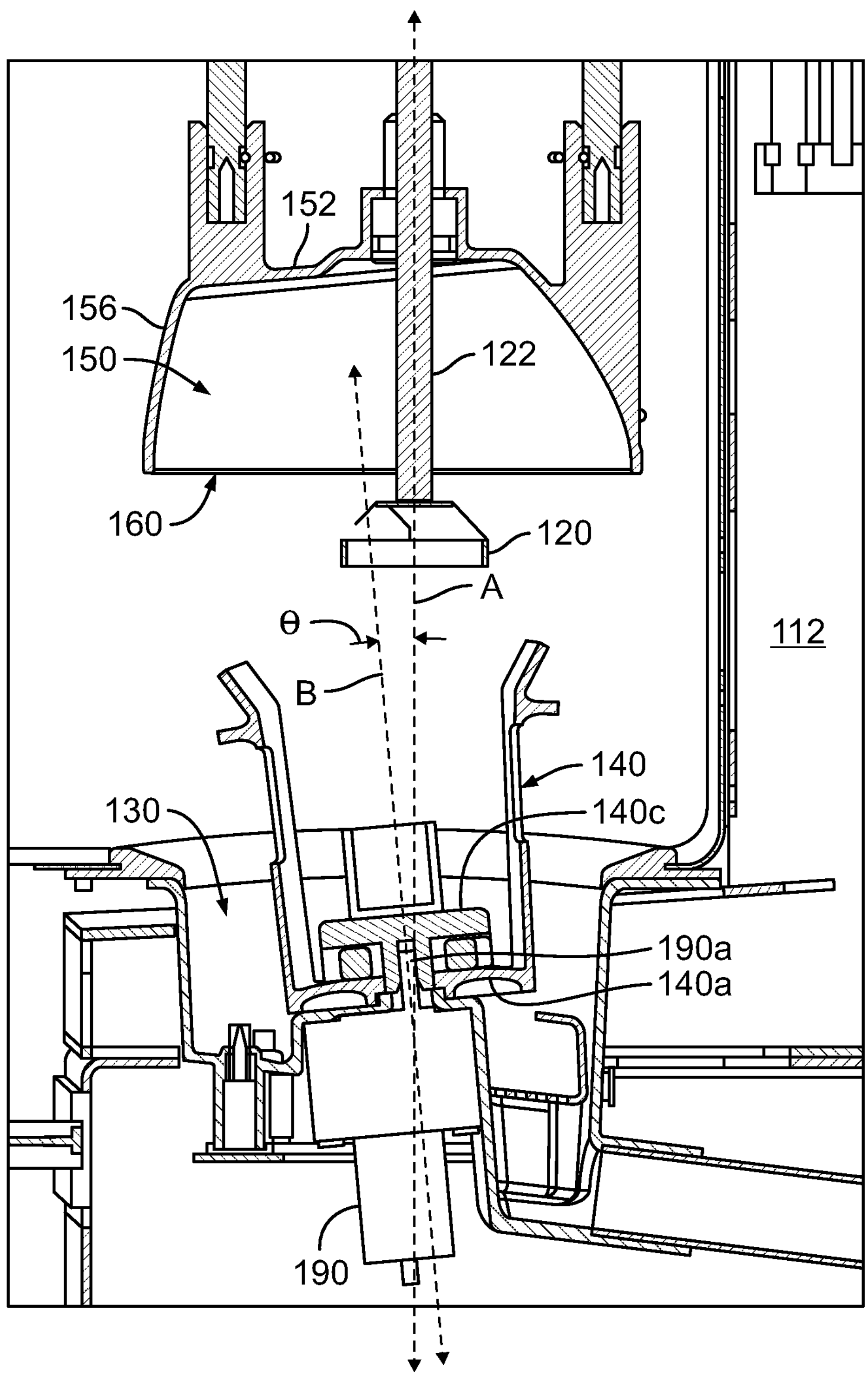


FIG. 16A

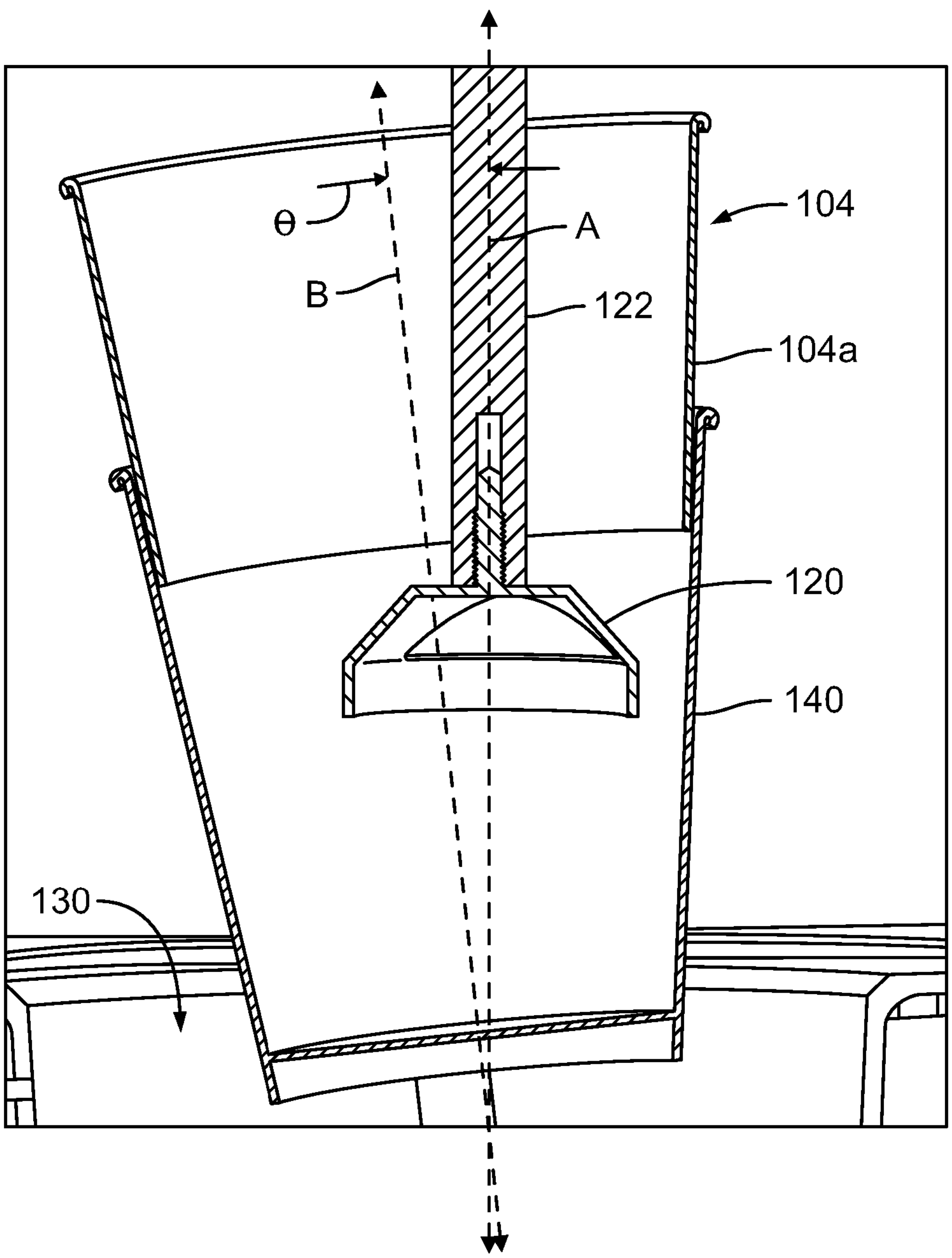


FIG. 16B

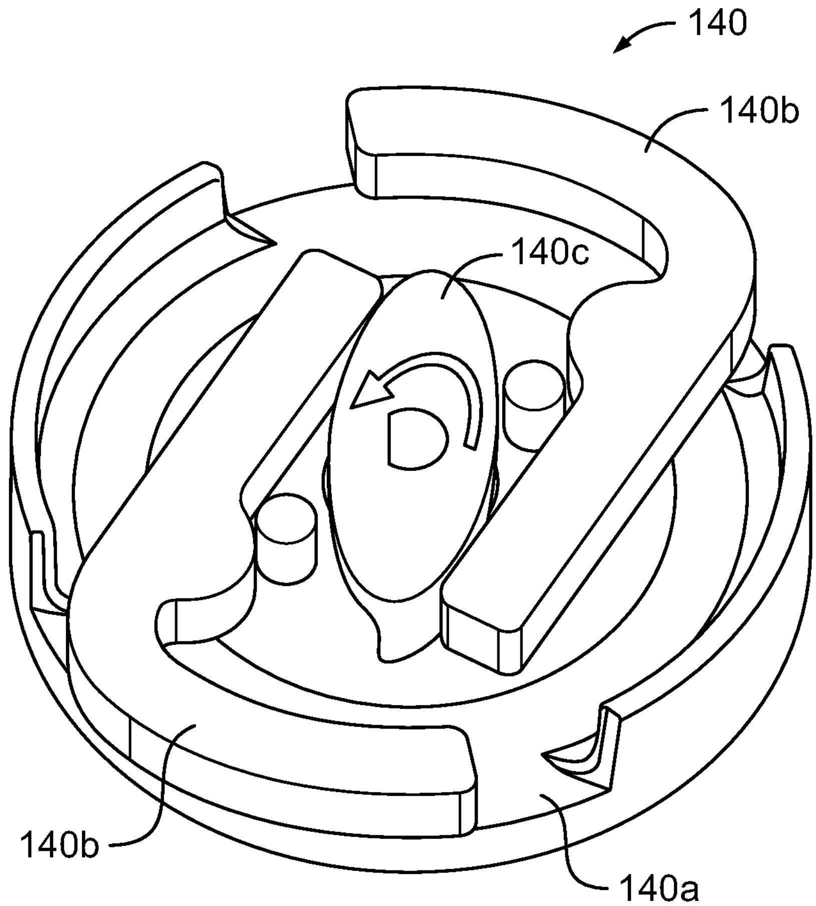


FIG. 17

AUTOMATED MIX IN-CUP APPARATUS

BACKGROUND OF THE DISCLOSURE

The present disclosure is directed to an automated mix in-cup apparatus and the related method of operation. The disclosure relates generally to the field of mixing consumable material. The apparatus is effective, fast, easy to operate, safe, and clean.

In a commercial food environment, it is often important to prepare items as quickly as possible. This objective runs counter to the mandate that all food preparation devices remain as sanitary as possible. That is, in the rush to deliver an item to a customer, it is possible that best practices regarding sanitation are not observed. It is also understood that human error increases as a person more quickly repeats a repetitive task. In other words, the person preparing the food or drink may "get sloppy" as the food or drink preparation is accelerated.

A conventional blender requires that the food/drink components are separately loaded into a blender jar. The jar is closed and placed on a blender base. The machine is activated to blend the contents, which are then placed into another receptacle. The blender and/or blender base is cleaned between consecutive blending operations.

Other commercial food preparation and drink delivery units include drink and ice dispensers and mixers for frozen drinks or confections. Drink and ice dispensers can be manually operated by a customer, as found in many 'fast food' establishments, or they can include the automated filling of various cup sizes.

Commercial mixers for frozen drinks or confections typically involve a user (i.e., employee) loading a metal cup with the beverage ingredients onto a machine. The cup is positioned so that a mixing blade is located in the cup. The user then activates the machine in order to spin the blade. In this conventional machine, it is possible to remove the cup while the mixing blade is still spinning, which results in the beverage/confection splashing onto the machine and/or user. To achieve a more even mix, a user may also manually move the cup up-and-down during the mix cycle. However, this practice increases the chances that the beverage or confection will splash out of the cup. Basically, the operation becomes less sanitary and less safe as the operator attempts to more quickly complete the task. The mixed material must be transferred to another receptacle.

Machines for automatically accomplishing the mixing operation have also been envisioned. For the automated units, there is still the question of cleaning the blade and apparatus used in the mixing operation. It is important that a flavor from one mix cycle does not contaminate the next mix cycle, which might be for a different flavor. In addition, the drink or confection must be cleaned from the machine regularly to avoid build up and contamination on the machine. It is thought that the operation of known automated machines is relatively slow and complex.

Moreover, the machine is generally intended to mix ingredients in several different cup sizes. Cups utilized in such machines are usually tapered. The blade diameter is, therefore, sized to fit within the bottom of the smallest intended cup size. As the cup size and diameter increases, there are increasingly more ingredients out of the range of the blade, e.g., around the perimeter of the cup, especially toward the top of the cup. As the viscosity of the ingredients also increases, it becomes difficult to obtain a homogenous blend of the ingredients, with the ingredients at the middle of the cup being well mixed but the ingredients at the perimeter being poorly mixed in.

Thus, there remains a need for an apparatus for homogeneously mixing consumable material in-cup, and a method of operating the same, that is fast, effective, safe, clean, and easy to operate. An automated mix in-cup apparatus and the method of operating the same as disclosed below addresses at least one of these or other needs.

SUMMARY OF THE DISCLOSURE

The present disclosure is directed to an automated mix in-cup apparatus adapted to mix consumable material. An 'in-cup mixer', 'mix in-cup' or 'blend in-cup' apparatus is understood to be a mixer where the consumable contents are not transferred to another vessel after the mix cycle and prior to consumption. Conventional mixers and blenders use dedicated mixing vessels and then all or part of the mixed material is transferred to a serving vessel (glass, Styrofoam cup, etc.).

Among other advantages, the automated mix in-cup apparatus disclosed herein is thought to be fast, clean, easy to operate, safe, and effective. The automated mix in-cup apparatus for mixing consumable material includes a frame supporting a stepper motor to move a carriage up and down on the frame. The carriage supports a mixing motor, a shield prop, and a combined splash shield and lid. The frame comprises a vertically aligned stand and a horizontal, cup-supporting leg. An optional cup-receiving holder is positioned on the leg of the frame.

In one embodiment, movement of the carriage is accomplished via the stepper motor and a lead screw. The lead screw passes though the carriage, and the carriage is supported on the lead screw via a nut. The stepper motor rotates the lead screw, also known as a translation screw, to translate the radial motion imparted by the stepper motor into a linear movement for the carriage. Rotation of the lead screw either raises or lowers the carriage on the frame. One or more guide rails pass through the carriage to keep the carriage aligned on the frame.

The mixing motor is attached to the carriage, and a rotatable mixing blade extends downwardly from the mixing motor. The mixing motor moves along with the carriage. The mixing blade is reciprocally moveable along with the mixing motor and carriage. When engaged, the mixing motor is operable to rotate the mixing blade in order to mix the consumable contents of the cup.

The horizontal portion of the frame may comprise a flat floor to support a cup or a cup-receiving holder. The floor may include liquid nozzles (small diameter apertures) from a manifold to eject a fluid upwardly from the floor. A drain aperture might also be employed in the floor as a liquid outlet. The drain is preferably proximate the cup-receiving position.

In another embodiment, the horizontal portion of the frame further comprises a liquid well comprising a recessed floor and a sidewall. The well could further include a liquid inlet manifold having at least one nozzle fluidly connecting the manifold and well. The well might further include a drain to serve as at least one liquid outlet for the well. In this embodiment, the optional cup-receiving holder is positioned above the floor of the well. The cup is positioned in the well or on the cup-receiving holder above the floor of the well. The cup-receiving holder may be selectively removed from the apparatus for cleaning.

The splash shield includes at least one sidewall, a closed lid or top, and a lower opening. The lid and shield might be integral parts or the shield might be secured to the lid via known fasteners. The splash shield and lid surround the mixing blade. The blade is connected to the mixing motor via a shaft that extends through an aperture in the shield's top end. A seal can be employed about the shaft in the lid aperture to prevent a fluid escaping upwardly from the shield. The seal is in close proximity to the shaft and may contain an internal helix groove. The helical groove on the inside surface of the seal directs any liquid between the shaft and seal downwardly.

The subject splash shield, mixing blade, and mixing motor are all reciprocally movable along a shared axis via the movement of the carriage on the lead screw. However, the splash shield can be moved independently of the mixing blade and motor via the shield prop, as described below.

Once engaged, the apparatus automatically moves the mixing blade, mixing motor, and splash shield from a home position to a mixing position. In the mixing position, the mixing blade is located within the dimensions of the cup. The shield rests on the cup, and the lid of the shield closes the cup. During a mix cycle, the blade can move up and down through the consumable material without displacing the shield.

The mixing motor, mixing blade, and splash shield return to the home position. The user removes the cup, and the apparatus moves the carriage to a cleaning position whereby the shield comes into contact with the frame, such as at the well floor, to selectively encase the cup-receiving position and optional cup-receiving holder on the frame. The blade can be positioned so as to pass through the cup-receiving holder during a cleaning cycle.

In one embodiment, a pulley system acts as a cord management system for a power cord connected to the mixing motor. The power cord, which might also enclose sensor wires, is fixedly secured to the carriage at a first end and is fixedly secured to the frame at a second end. The carriage moves up and down on the frame. As a cord management system, the pulley system includes one stationary and one moveable, spring-biased pulley to manage slack in the power cord as the carriage moves up and down. As the carriage moves down on the frame, the moveable pulley is lifted by the tension placed on the power cord. As the carriage moves up on the frame, a spring biases the moveable pulley down to take up slack in the power cord.

In use, the machine starts at a first home or open position. A user places a cup with consumable material on the cup-receiving holder and activates the apparatus. The stepper motor rotates the lead screw in order to lower the carriage. The downward movement of the carriage lowers the mixing motor, mixing blade, and splash shield to a mixing position. As a result, the shield is lowered around the cup until the lid contacts and closes the open top of the cup. Similarly, the mixing blade enters the interior space of the cup.

In this mixing position, the shield at least partially isolates the cup from the user. The lid also prevents the material in the cup from exiting the cup during a mix cycle. Once the apparatus is in the mixing position, the motor is activated to rotate the mixing blade thereby causing the consumable material to be mixed. The speed of the blade may be variable, and a speed sensor can be included so as to output motor speed feedback to a control board. In addition, the blade may move up and down within the cup during the mix cycle without displacing the splash shield.

After the mix cycle is completed, the shield and blade automatically retract to an open or home position so as to allow access to the cup. The cup is then removed. A cleaning cycle is then manually or automatically activated. The carriage is again lowered. In the cleaning position, the shield comes into contact with the frame to create a sealed, enclosed space. For the cleaning cycle, the blade can be positioned at various distances from the floor of the frame/well, including beneath the level of the cup-receiving holder.

Fluid is injected into the interior of the shield via the inlet manifold so as to contact the shield and blade during the cleaning cycle. The fluid is used to rinse the shield and blade. The blade may rotate during the cleaning cycle to increase fluid distribution or force. The rinse fluid is removed via the drain. In this manner, the automated mixing of the material and subsequent cleaning of the apparatus can be achieved. The cleaning cycle is fast and effective. The blade is isolated from the user during the mixing and cleaning operations. The cleaning operation is thought to remove all food or drink material and to prevent any flavor contamination between mix cycles.

In at least one embodiment, it is also envisioned that a number of sensors could be employed. The sensors are used to electronically determine the position of the motor, blade, and/or shield and to act as interlock mechanisms to disengage the mixing motor if a user displaces the shield during the mixing or cleaning cycles. In other words, the feedback from the sensors is used to automatically prevent the rotation of the blade unless the splash shield is properly positioned. In one embodiment, the failure to remove a cup from the cup-receiving position prior to initiating the cleaning cycle would also prevent the movement of the mixing blade to the blade's cleaning position. The blade or blade shaft would contact the cup. In response, the unit would return the shield to the home position.

In one embodiment, the automated mix in-cup apparatus comprises a frame including a cup-holder to secure a tapered cup selectively placed therein, and a first motor operatively connected to the cup-holder to rotate the cup-holder. A reciprocating carriage is axially supported by the frame and supports a second motor and a rotatable mixing blade to mix a consumable material. The mixing blade is secured to a shaft axially extending from the second motor, the shaft defining a longitudinal axis and the second motor configured to rotate the shaft and the mixing blade about the longitudinal axis. Reciprocal movement of the carriage axially translates the mixing blade into and out of the tapered cup selectively placed in the cup-holder. The cup-holder and the first motor are oriented at an incline, the incline defining a tilt angle relative to the longitudinal axis of the shaft, whereby the shaft and the rotatable blade are positioned off-center relative to the tapered cup selectively placed in the cup-holder.

Further features and advantages of the present disclosure will become apparent to those of skill in the art from the following detailed description of a preferred embodiment taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing summary, as well as the following detailed description of the disclosure, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the disclosure, there are shown in the drawings embodiments of a mix in-cup apparatus which are presently preferred. It should be understood, however, that the disclosure is not limited to the precise arrangements and instrumentalities shown. In the drawings:

FIG. **1** is a perspective view of a housing for a combined fluid or ice dispensing and mixing unit wherein the mixing apparatus is envisioned as the apparatus disclosed herein;

FIG. **2** is a perspective view of a first preferred embodiment of the automated mix in-cup apparatus as disclosed herein wherein a mixing blade and a splash shield are shown in an elevated or home position;

FIG. **3** is a side cut-away view of the same wherein a well, a cup-receiving holder, and a drain are further illustrated;

FIG. **3**A is a side view of a seal member as further disclosed herein;

FIG. **4** is a perspective, semi-transparent view of one embodiment of the subject apparatus wherein a mixing blade and splash shield are shown in an mixing or down position so that the shield is in the well and at least partially encloses the opening of a cup;

FIG. **5** is a side cut-away view of the same;

FIG. **5**A further illustrates a cord management pulley system as disclosed herein;

FIG. **6** is a perspective, semi-transparent view of an embodiment of the subject apparatus wherein the splash shield is in a mixing or down position and the blade is in a mixing position so as to engage the contents of a cup;

FIG. **7** is a side cut-away view of the same;

FIG. **8** is a perspective, semi-transparent view of an embodiment of the subject apparatus wherein the splash shield and blade are in a cleaning position;

FIG. **9** is a side cut-away view of the same;

FIG. **10** is a top-down view of the well and the cup-receiving holder as disclosed herein in at least one embodiment;

FIG. **11** is a top-down cut-away view of the a water inlet manifold and the drain as disclosed herein;

FIG. **12** is an exploded view of the selectively removable cup-receiving holder, a liquid well, and a manifold cover as found in one embodiment disclosed herein;

FIG. **13** is a perspective view of the subject apparatus further illustrating a selectively removable cup-receiving holder as found in one embodiment disclosed herein

FIG. **14** is a close-up, semi-transparent view of the splash shield in the well and a related interlock safety mechanism;

FIG. **15** is a three quarter front view of one embodiment of the subject apparatus illustrating sensors located on the apparatus;

FIG. **16** is a side cut-away view of a second preferred embodiment of the automated mix in-cup apparatus as disclosed herein wherein the mixing blade and the splash shield are shown in the elevated or home position, and a cup-receiving holder is oriented at an incline;

FIG. **16**A is an enlarged partial side cut-away view of the splash shield, mixing blade and cup-receiving holder of FIG. **16**;

FIG. **16**B is a further enlarged partial side cut-away view of the mixing blade and cup-receiving holder of FIG. **16** with a tapered cup placed therein; and

FIG. **17** is a top-down cut-away view of the cup-receiving holder of FIG. **16**.

DETAILED DESCRIPTION

Certain terminology is used in the following description for convenience only and is not limiting. The words "lower," "bottom," "upper" and "top" designate directions in the drawings to which reference is made. The words "inwardly," "outwardly," "upwardly" and "downwardly" refer to directions toward and away from, respectively, the geometric center of the mix in-cup apparatus, and designated parts thereof, in accordance with the present disclosure. Unless specifically set forth herein, the terms "a," "an" and "the" are not limited to one element, but instead should be read as meaning "at least one." The terminology includes the words noted above, derivatives thereof and words of similar import.

It should also be understood that the terms "about," "approximately," "generally," "substantially" and like terms, used herein when referring to a dimension or characteristic of a component of the invention, indicate that the described dimension/characteristic is not a strict boundary or parameter and does not exclude minor variations therefrom that are functionally similar. At a minimum, such references that include a numerical parameter would include variations that, using mathematical and industrial principles accepted in the art (e.g., rounding, measurement or other systematic errors, manufacturing tolerances, etc.), would not vary the least significant digit.

The present disclosure is directed to an automated mix in-cup apparatus and the method of using the same. In general, the automated mix in-cup apparatus is thought to be more effective, safer, faster, cleaner and easier to operate than known devices. The apparatus and method are described and illustrated in terms of various embodiments. Of course, the present disclosure is not limited to the embodiments disclosed herein but also includes variations and equivalent structures that would be apparent to one of skill in the art, having studied the subject disclosure.

Turning now to the drawings, FIG. **1** illustrates a combined commercial fluid/ice dispensing and mixing unit **2**. Unit **2** comprises an outer housing to cover both the dispensing and mixing machinery. Unit **2** may also include a cabinet **6** accommodating a plurality of fluid containers **8** fluidly connected to a dispenser. An ice or frozen slurry dispenser and/or hopper may also be included in the unit.

The overall operation of unit **2** comprises a user selecting the cup **4**, which may be selected from a single size or a plurality of differently sized cups, and placing cup **4** on unit **2** proximate to a dispensing mechanism (not illustrated or described further herein). The dispensing mechanism is actuated to at least partially fill cup **4** from fluid containers **8** and/or a frozen fluid dispenser. The fluid containers **8** could contain various flavors of consumable drink mix. The cup would also at least partially be filled with ice or other frozen consumable material from unit **2**.

One or more automated mix in-cup apparatuses **10** are located next to the dispensing apparatus for mixing/blending drinks such as smoothies, milkshakes, ice coffee drinks, or the like. After the step of dispensing a fluid into the cup, the user positions cup **4** containing the selected flavor and frozen material at a cup-receiving position on mix in-cup apparatus **10**. Mix in-cup apparatus **10** is then engaged to commence an automated mixing operation of the cup contents, as explained further below. The user does not contact the apparatus **10** other than to select mix cycles or otherwise actuate the switches or buttons necessary to begin the operation of the unit.

With respect to FIGS. **2-14**, there is illustrated one or more embodiments of the mix in-cup apparatus and the method of operation of the same as described herein. The apparatus moves between three operational positions, as detailed further below with specific reference to the figures and labeled elements.

In general, the first position is the open or "home" position where a mixing blade, a mixing motor, and a splash shield are elevated above a cup-receiving position so as to allow a user access to the cup-receiving position. In the mixing position, the splash shield is lowered until it engages and closes cup **4**. The shield is held on the cup by gravity. While the shield always surrounds the sides and top of the mixing blade, the shield also surrounds the sides of cup **4** and closes the top of cup **4** in the mixing position. The mixing blade is positioned inside cup **4** when the apparatus is in the mixing position. During a mix cycle, the blade may move up and down within the cup independent of the movement of the splash shield.

In a cleaning position, the cup is first removed from the cup-receiving position, and the shield is again lowered until it contacts a floor. The floor and shield act to create a sealed interior space. In the cleaning position, the blade is moved into a position that may be below the cup-receiving position. A user cannot access the mixing blade in the cleaning or mixing positions without manually displacing the shield.

Turning to FIGS. **2** and **3** in further detail and with specific reference to the labeled elements, there is illustrated a mix in-cup apparatus **10** in accordance with at least one embodiment of this disclosure. The automated mix in-cup apparatus **10** for mixing consumable material includes a frame **12** supporting a stepper motor **13**. Frame **12** in this embodiment is generally an L-shaped, substantially vertical structure with sufficient width to support mechanical components as described below. Frame **12** could in turn be mounted to the structure of the combined unit **2** and be largely enclosed behind a housing. It is also envisioned that mix in-cup apparatus **10** might instead serve as a standalone device for mixing consumable material in cup **4**.

FIGS. **2** and **3** illustrate the home position of apparatus **10**. As illustrated, the horizontal portion of the L-shaped frame **12** supports cup **4** at a cup-receiving position. The stand portion of frame **12** supports a vertically aligned lead screw **15** connected to stepper motor **13**. Stepper motor **13** is positioned at the top of frame **12**. The distal end of lead screw **15** is mounted in a bearing (not illustrated).

One or more guide rails **16** are vertically aligned on frame **12** and are parallel to lead screw **15**. Lead screw **15** and guide rails **16** pass through a carriage **17**. A nut (not illustrated) under carriage **17** on lead screw **15** retains carriage **17** in place on lead screw **15**. As stepper motor **13** rotates lead screw **15**, the nut moves up and down on the screw. As a result, carriage **17** moves up and down relative to frame **12**. Guide rails **16** further support carriage **17** and maintain the alignment of carriage **17** as it moves. Overall, activating stepper motor **13** rotates lead screw **15**, and lead screw **15** translates the rotational movement into the linear up-and-down movement of carriage **17**.

In one embodiment, as explained further below, a pulley system acts as a cord management system for a power cord **19** connected to carriage **17**. Power cord **19**, which might also enclose sensor wires, is fixedly secured to carriage **17** at a first end and is fixedly secured to frame **12** at a second end. To account for the movement of carriage **17**, the pulley system includes one stationary pulley **18** and one moveable, spring-biased pulley **21**.

Moveable pulley **21** is at least partially placed within a pulley housing that slides within a vertical track defined by frame **12**. Moveable pulley **21** includes an axle mounted to the sliding housing. A spring **23** is secured to the housing at a proximate end. Distal end of spring **23** is attached to a point on frame **12** beneath the pulley housing so as to maintain a tension force on the pulley housing. As carriage **17** moves down on lead screw **15**, moveable pulley **21** is lifted by the tension placed on power cord **19**. That is, the downward force on carriage **17** overcomes the tension force of spring **23**. As carriage **17** is lifted on lead screw **15** so as to move up relative to frame **12**, spring **23** biases moveable the pulley housing downwards so that pulley **21** move down within the frame's track. In this manner, any slack in cord **19** is controlled by the pulley system.

Carriage **17** supports a mixing motor **14**, a shield prop **70**, and a splash shield **50**. Any suitable type of electric motor may be employed as mixing motor **14**, as would be known or used in the mixing art. A mixing motor housing **54** surrounds and supports mixing motor **14** and housing **54**, in turn, is secured to carriage **17**. In this manner, carriage **17** supports motor **14**. Mixing motor **14** is axially aligned above cup **4** when cup **4** is in the cup-receiving position. The horizontal portion of the frame defines a floor to support cup **4** or an optional cup-receiving holder **40** may be positioned on frame **12** at the cup-receiving position. In an embodiment where frame **12** defines a fluid-receiving well, holder **40** is at least partially placed in the well. With the holder, a cup never contacts a drain or floor of the apparatus, which is thought to be more sanitary.

A rotatable mixing blade **20** extends vertically downwardly from mixing motor **14** via a shaft **22**. Blade **20** is used for mixing a consumable material in cup **4**. Motor **14** is operable to rotate mixing blade **20** and shaft **22**. Blade **20** moves relative to frame **12** when mixing motor **14** is raised or lowered via carriage **17**. Shaft **22** extends from mixing motor **14** at a fixed length. As such, blade **20** is reciprocally moveable along a shared axis with mixing motor **14**.

In one embodiment, frame **12** further comprises a liquid well **30** sharing a vertical axis with cup **4**, mixing motor **14**, shaft **22**, and splash shield **50**. Well **30** is a recess in the horizontal portion of the L-shaped frame **12** including a floor **32** and a sidewall **34**. In this embodiment, floor **32** is considered to be a part of frame **12**. Well **30** may be a plastic molded part inserted into frame **12**.

A liquid inlet manifold **36** is integral to or connected to frame **12**, and manifold **36** includes at least one nozzle fluidly connecting the manifold to the exterior of frame **12** (see also FIGS. **10** and **11**). In the illustrated embodiments where an optional recessed well **30** is employed, manifold **36** is integral to or connected to well **30**. A cleaning liquid, which might be water or a combination of water and a known cleaning agent, is selectively ejected from manifold **36**. A drain **38** acts as at least one liquid outlet. In the embodiment containing the well, drain **38** is integral to or connected to well **30**. In either embodiment, a drainpipe would connect to the drain so that the cleaning fluid is removed from apparatus **10**.

The optional cup-receiving holder **40** is positioned to support a cup above frame **12**, such as above floor **32** of well **30**. Holder **40** may be selectively removable from the apparatus for cleaning, as further described below (see also FIG. **14**).

Splash shield **50** may consist of an opaque, semi-transparent or transparent material. In the cup-receiving position, such as when cup **4** is placed on holder **40**, cup **4** is axially aligned beneath shield **50**.

Shield **50** comprises a shield lid **52** and a cylindrical sidewall **56** depending from lid **52**. Shield **50** defines an open bottom end **60** into which cup **4** and/or cup-receiving holder **40** can be placed. Shield **50** is suspended from motor housing **54** by a shield prop **70**. Prop **70** includes two guide rods **72** and upper stop plate **74**. In a home position, stop plate **74** rests atop mixing motor **14** or mixing motor housing **54** with guide rods **72** securely fixed to shield lid **52**.

As carriage **17** moves to a mixing position, shield lid **52** engages the open top of cup **4** so as to close the lid. Shield sidewall **56** at least partially surrounds cup **4** at the cup-receiving position. In the mixing position, the downward movement of shield **50** is limited by the height of cup **4**, and shield **50** rests atop cup **4**. However, carriage **17** may continue to move downward along lead screw **15** after shield **50** engages cup **4**. The continued downward motion of carriage **17** causes motor housing **54** to move along shield guide rods **72**. The upper stop plate separates from mixing motor **14** and motor housing **54**. Carriage **17** can continue downwards until motor housing **54** engages the top of lid **52**.

Moving carriage **17** upwards will not displace shield **50** until mixing motor **14** and/or motor housing **54** engage upper stop plate **74**. Once engaged, the continued upward movement of carriage **17** lifts stop plate **74**. Guide rods **72**, which are fixed at a first end to plate **74** and at a second end to shield **50**, then lift shield **50**. For aesthetic purposes, an outer housing **53** can selectively nest over motor housing **54**. Outer housing **53** is supported atop lid **52**. As motor housing **54** moves away from shield **50**, outer housing **53** encases guide rods **72** and shaft **22** between motor housing **54** and lid **52**. As the motor housing **54** is brought into closer proximity to lid **52**, outer housing **53** nests over motor housing **54**.

Splash shield **50** surrounds blade **20** on all sides and covers the top of blade **20**. Shaft **22** extends through an aperture **62** in the shield's top end. A seal **63** is employed to prevent the escape of a fluid up and through lid **52**. One embodiment of seal **63** is illustrated in FIG. **3**A. Seal **63** is in the lid aperture **62** through which shaft **22** passes. Seal **63** reduces or prevents fluid from passing around shaft **22** upwardly through the shield's top end. Shaft **22** can move independently of shield **50** so seal **63** allows for the linear movement of shaft **22** into and out of shield **50**. The inside face of seal **63** in contact or close proximity with shaft **22** includes a helical groove **64**. Groove **64** permits and encourages the downward flow of fluid were any fluid to enter seal **63**.

FIGS. **2** and **3** illustrate motor **14** and shield in the home position whereby a user can access cup **4** and the cup-receiving position. In this home position, mixing motor **14** cannot be activated, as further described below.

Turning then to FIGS. **4** and **5**, there is illustrated the embodiment of FIGS. **1** and **2** but where carriage **17** has been moved downwards to the mixing position. In the mixing position, as briefly referenced above, shield **50** comes to rest on a cup **4**. In the absence of a cup, shield **50** would rest on frame **12**. In this illustrated embodiment, shield **50** does not contact frame **12** or floor **32** of well **30** due to the height of the cup. In the mixing position, cup **4** is closed by lid **52** and is at least partially surrounded by shield **50**.

In one embodiment, the connection of shield sidewall **56** to closed top end **58** forms a frustoconical shape or portion **59**. That is, the connection between sidewall **56** and lid **52** is sloped as if to form a cone. However, the cone tip is truncated.

Conical portion **59** creates an effective seal on cup **4** despite the use of cups that might be of different diameters. Conical portion **59** also serves to center cup **4** on the cup-receiving position or holder. Where the conical portion engages a cup disproportionally on one side, the slope of lid **52** translates the downward motion of shield **50** into a lateral motion to better position cup **4** within shield **50**.

FIG. **5**A further illustrates the pulley-based cord management system. A portion of frame **12**, which helps to define a vertical track, is removed to better illustrate the cord management system. Moveable pulley **21** is secured via an axle to the moveable pulley housing. The pulley housing slides within the vertical track defined by frame **12**.

The downward movement of carriage **17** places tension on cord **19**. This tension exceeds the spring bias provided by spring **23**. As a result, pulley **21** moves up within frame **12**. As carriage **17** is lifted on lead screw **15** so as to move up relative to frame **12**, spring **23** biases pulley **21**, via the pulley housing, downwards. In this manner, any slack in cord **19** is controlled by the pulley system.

With respect to FIGS. **6** and **7**, it is evident that blade **20** and motor **14** may continue to move down relative to frame **12** even after shield **50** comes into contact, and is stopped by, cup **4**. Prop **70** is fixed to shield **50** by guide rods **72**. Motor **14** slidably moves along guide rods **72**. As carriage **17** continues to move mixing motor **14** closer to shield **50**, upper stop plate **74** moves away from mixing motor **14**. In this manner, mixing motor **14** can be reciprocally moved up and down without displacing shield **50** during the mix cycle. The ability to move blade **20** up and down during a mix cycle increases the quality and consistency of the blended product.

Following the mix cycle, which can comprise a pre-programmed sequence of blade movements and variable blade speed changes, stepper motor **13** is actuated to rotate lead screw **15** to lift carriage **17**. The motor engages the stop plate **74**. As a result, shield **50** and blade **20** are withdrawn from cup **4**. Cup **4** is then removed.

Turning now to FIGS. **8** and **9**, apparatus **10** or a user then engages a cleaning cycle. Carriage **17** is positioned, via the stepper motor and lead screw, in a cleaning position. In the cleaning position, shield **50** brought into contact with frame **12** (such as well **30**) to create an enclosed space about the cup-receiving position. Cup-receiving holder **40** would be encased by shield **50** and well floor **32**, for example.

As further illustrated in FIGS. **8** and **9**, with cup **4** removed, motor **14** can be lowered past the lowest mix position. As a result, blade **20** and/or shaft **22** extend below the cup-receiving position. For example, blade **20** can pass through the cup-receiving holder **40**. During the cleaning operation or cycle, it would again be possible to reciprocally move blade **20** up and down without displacing shield **50**.

In the cleaning operation, and with reference to FIGS. **10** and **11**, fluid enters a manifold **36** via pipe **35**. The fluid is transmitted to the space enclosed by shield **50** via manifold **36** and fluid nozzles **37**. The fluid will strike blade **20**, which can be rotated during the cleaning cycle to further disperse the fluid. The cleaning operation rinses the interior of shield **50** (including shield lid **52**), cup-receiving holder **40**, blade **20**, and shaft **22**. Cleaning fluid exits the frame via the drain **38**, which is tied to an outlet pipe. The cleaning operation is automatic and requires little to no user involvement. As such, the automated mix in-cup apparatus is self-cleaning, which permits a user to fill another cup during the cleaning operation.

FIG. **12** illustrates the underside of well **30** with manifold **36** in an exploded view. A bottom plate **39** of manifold **36** is removed to reveal one embodiment of the interior of manifold **36**. Holder **40** is illustrated as being removed from well **30**.

Turning to FIG. **12**, cup-receiving holder **40** includes an open ring **42** upon which cup **4** rests. Ring **42** provides an aperture through which blade **20** passes when carriage **17** is in the cleaning position.

As briefly noted above, holder **40** may be selectively removable from frame **12**. Holder **40** could include one or more hollow posts **44** that engage vertical posts **46** on frame **12**. For instance, vertical posts **46** might be integral to well floor **32**. Vertical posts **46** nest within hollow posts **44** of the holder in order to frictionally retain holder **40** in place. A user could lift holder **40** off frame **12** to independently clean holder **40**, if necessary. Removing holder **40** provides the means to further clean the holder and/or the drain and frame that are located beneath holder **40**.

Overall, apparatus **10** is easy to operate, safe, and fast in that shield **50** and mixing blade **20** automatically move into and out of the mix position. A user is provided one-handed operation in that they merely need to place the cup before the mix cycle and remove the cup after the mix cycle. There is no need to manually manipulate the cup, the shield, or any other components of the apparatus besides cup **4**. Nevertheless, a user may mistakenly attempt to access or manipulate the splash shield or to otherwise access the cup during a mix cycle.

Turning now to FIG. **14**, there is illustrated a close-up view of shield **50** in the mixing position. In the illustrated embodiment, a magnetic strip **80** is integrated into or otherwise secured to sidewall **56** of shield **50**. Corresponding shield sensors **82** on frame **12** (e.g., in well **30**) are operable to detect magnetic strip **80**. In the mix and cleaning positions, mixing motor **14** will not rotate blade **20** unless shield sensors **82** detect magnetic strip **80**. A control unit will disengage mixing motor **14** once strip **80** is displaced. As such, a user cannot lift shield **50** to access cup **4** without disengaging mixer motor **14**.

Additional sensors provide feedback to the control unit, as further illustrated in FIG. **15**. A home sensor **84** is used to determine if carriage **17** is properly returned to the home position after each mix and cleaning cycle. Home sensor **84** is operable to detect a magnet **86** located on carriage **17**. Stepper motor **13** runs until home sensor **84** detects magnet **86** or until there is a time-out condition. For example, if carriage **17** is obstructed, stepper motor **13** will run for a predetermined period of time that is longer than it takes for carriage **17** to return to the home position. If the magnet **86** is not detected within that time period, stepper motor **13** is deactivated and apparatus **10** would be reset.

Once home sensor **84** detects magnet **86**, stepper motor **13** reverses lead screw **15** until magnet **86** is no longer detected. Carriage **17** is then raised a second time until magnet **86** is detected by home sensor **84**. This provides an optional calibration mechanism so that the position of carriage **17** is calibrated prior to a mix or cleaning cycle.

A cup sensor **88** also works in conjunction with magnet **86** and the control unit. The failure to detect magnet **86** at cup sensor **88** indicates to the control unit that shield **50** is not in the cleaning position. As referenced above, in the cleaning position, shield **50** contacts frame **12** (e.g., well floor **32**). Shield **50** creates an enclosed interior space to capture the cleaning fluid during the cleaning cycle. With the cup in place, shield **50** does not reach the frame or well floor. As a result, shield **50** will not properly rest against frame **12** or well floor **32**. The shield will not create an enclosed interior space so that the cleaning fluid will not be fully contained during the cleaning cycle. Cup sensor **88** prevents the initiation of the cleaning cycle where a user leaves the cup in place.

In addition, carriage **17** moves blade **20** to a cleaning position that is below the blade's "mixing position" and below the cup-receiving portion of holder **40**. If a user forgets to remove cup **4**, blade **20** will move downwardly until it contacts the floor of the cup. The floor will resist the further movement of blade **20** on shaft **22**. The extra load on the stepper motor causes it to stall. As a result, carriage **17** will not be in the proper position for cup sensor **88** to detect magnet **86** on carriage **17**.

The method of using the subject apparatus provides for one-handed operation that is fast, safe, clean, easy to use, and effective. In use, a user places a cup with consumable material at the cup-receiving position, such as on the cup-receiving holder, and activates the apparatus via a switch, button, touchpad, or the like. The apparatus automatically lowers the carriage to the mixing position. In the mixing position, the shield lid closes the top of the cup, and the mixing blade is positioned within the cup and consumable material.

The mixing motor is automatically activated to rotate the mixing blade thereby causing the consumable material to be mixed. The speed of the blade may be variable, and the blade may move up and down within the cup during the mix cycle without displacing the splash shield.

After the mix cycle is completed, the carriage is returned to the home position whereby the splash shield and mixing blade are lifted from the cup. The user can access and remove the cup from the cup-receiving position.

A cleaning cycle is then manually or automatically activated. The splash shield, which still surrounds the blade, is again lowered into contact with the frame. The splash shield and frame (such as well floor **32**) create an enclosed entire space. The cup-receiving position and/or cup-receiving holder are encased by the splash shield and frame. The blade can be positioned at various distances from the frame including beneath the level of the cup-receiving holder. Mixing blade could be moved during the cleaning cycle without displacing the splash shield.

The cleaning cycle is initiated, and fluid is injected into the interior of the shield via an inlet manifold. The fluid contacts and cleans the shield (including the lid), blade, cup-receiving position, and optional cup-receiving holder. The mixing motor can be engaged to rotate the mixing blade during the cleaning cycle to increase fluid distribution or force. The rinse fluid is removed via the drain. In this manner, the automated mixing of the material and subsequent cleaning of the apparatus can be achieved. A user may select the flavors to be dispensed for the next order while the mix in-cup apparatus mixes a previous order and executes a self-clean operation. The mixing blade is isolated from the user during the mixing and cleaning operations. An attempt to displace the splash shield during the mixing or cleaning cycles deactivates the mixing motor.

FIGS. **16**-**17** illustrate another embodiment of the automated mix in-cup apparatus **110**. The reference numerals of the present embodiment are distinguishable from those of the above-described embodiment(s) by a factor of one-hundred (100), but otherwise indicate the same elements as indicated above, except as otherwise specified. The automated mix in-cup apparatus **110** of the present embodiment is substantially similar to that of the earlier embodiment(s). Therefore, the description of certain similarities between the embodiments may be omitted herein for the sake of brevity and convenience, and, therefore, is not limiting.

Generally, a tapered cup **104** (FIG. **16**B) is utilized with the mix in-cup apparatus **110**. The taper of the cup **104** is generally between approximately 8° and approximately 8°. As should be understood, the cup **104** tapers outwardly from the base (lower) end of the cup **104** to the open upper end of the cup. A distinguishing feature of the present embodiment is that the cup-receiving holder **140** is oriented at an incline, defining a tilt angle θ relative to a longitudinal axis A of the shaft **122**. Therefore, a tapered cup **104** placed in the cup-receiving holder **140** is also oriented at the tilt angle θ. In the mixing position, the shaft **122** and the mixing blade

120 are, therefore, positioned off-center relative to a tilted, tapered cup **104** placed in the cup-receiving holder **140** (FIG. **16**B).

In one embodiment the tilt angle θ of the cup-receiving holder **140** is between approximately 3° and approximately 7°, generally equivalent to the taper of the cup **104**. Therefore, the tilted/inclined orientation of the cup-receiving holder **140** orients a tapered cup **104** placed therein such that a side **104***a* of the tapered cup **104** becomes closest to the shaft **122** and extends generally parallel with the longitudinal axis A of the shaft **122**. In one preferred embodiment, without limitation, the tilt angle θ of the cup-receiving holder **140** is approximately 5°.

As shown best in FIG. **16**A, the mix in-cup apparatus **110** also includes a holder-rotating motor **190** operatively connected to the cup-receiving holder **140** to rotate the holder **140** about a central axis B thereof. In one embodiment, the motor **190** rotates the holder **140**, and, thus, a tapered cup **104** placed therein, between approximately 20 rpm to approximately 30 rpm. As shown in FIGS. **16** and **16**A, the motor **190** is positioned in the horizontal portion of the L-shaped frame **112**, proximate the well **130**. In the illustrated embodiment, the motor **190** is directly coupled to the cup-receiving holder **140** (as will be described in further detail below). Accordingly, the motor **190** is also oriented at substantially the same tilt angle θ. As should be understood, however, the operative connection and orientation between the motor **190** and holder **140** is not so limited, as the motor **190** may be rotatably coupled with the holder **140** via any of numerous different methods, such as, for example, without limitation, via a rotating gear system. As should also be understood by those of ordinary skill in the art, any suitable type of electric motor, currently known or that later becomes known, capable of performing the rotational function described herein, may be employed as the holder-rotating motor **190**, such as, for example, without limitation, a stepper motor.

The mix in-cup apparatus **110** also includes a splash shield **150** supported by the carriage **117**, having a shield lid **152**, a sidewall **156** and an open bottom end **160**. Another distinguishing feature of the present embodiment is that the shield lid **152** is substantially equally inclined to the incline of the cup-receiving holder **140**, i.e., the shield lid **152** is oriented at substantially the same tilt angle θ, and thus, is substantially equally inclined to the incline of a cup **104** placed therein. Advantageously therefore, in the mixing position, the splash shield lid **152** engages substantially the entire circumference of the open top end of a cup **104** placed in the cup-receiving holder **140** and acts as a bearing surface to stabilize the rotating cup **104** during the mixing cycle.

The mix in-cup apparatus **110** is also intended to accommodate several different sized cups **104** for mixing the consumable material therein. Accordingly, the cup-receiving holder **140** is adjustably configured to securely receive different sized cups **104**. In the illustrated embodiment, as shown best in FIG. **17**, the holder **140** includes a base **140***a*, at least two opposing clamping arms **140***b* pivotably attached to the base **140***a* (in a manner well understood by those of ordinary skill in the art) and a generally central cam **140***c* therebetween, rotatable relative to the base **140***a*. Rotation of the cam **140***c* engages and pivots the clamping arms **140***b* from a radially expanded position (FIG. **17**) to a radially contracted position, clamping a cup **104** placed in the holder **140** (see FIG. **16**).

As shown in FIG. **16**A, a shaft **190***a* of the motor **190** projects through the base **140***a* of the holder **140** and is rotatably coupled with the cam **140***c* in a manner well known by those of ordinary skill in the art. For example, without limitation, the shaft **190***a* may be keyed to the cam **140***c*, interferingly fit with the cam **140***c*, adhesively attached to the cam **140***c* or the like. Rotation of the motor **190** effectuates rotation of the cam **140***c* to, in turn, engage and pivot the clamping arms **140***b* from the radially expanded position to the radially contracted position, wherein the clamping arms **140***b* radially contract until the arms **140***b* engage and secure a cup **104** placed in the holder **140** therebetween. Once the clamping arms **140***b* clampingly engage and hold the cup **104**, rotation of the shaft **190***a* effectuates rotation of the entire holder **140**, including the cup **104** placed therein.

In the illustrated embodiment, the clamping arms **140***b* are manually pivotable from the radially contracted position back to the radially expanded position, e.g., after the mixing cycle is complete, the motor **190** stops running and a user wishes to remove the cup **104**. As should be understood by those of ordinary skill in the art, however, the clamping arms **140** may alternatively be biased via a biasing member, e.g., a spring, into the radially expanded position, wherein rotation of the motor **190** overcomes the biasing force of the biasing member and rotates the cam **140***c* to pivot the clamping arms **140***b* to clamp the cup **104**. Once the motor **190** stops rotating, the biasing force of the biasing member automatically returns the clamping arms **140***b* to the radially expanded position thereof, disengaging the clamping arms **140***b* from the cup **104**.

In operation, a tapered cup **104** is placed in the cup-receiving holder **104** and the carriage **117** moves to the mixing position (as explained with respect to the mix in-cup apparatus **10**), such that the mixing blade **120** is positioned within the tapered cup **104** and the consumable material, and the shield lid **152** bears on the cup **104**. The holder-rotating motor **190** is activated, thereby causing the clamping arms **140***b* to engage and clamp the cup **104** (as explained above) and also to rotate the cup-receiving holder **140** and the cup **104** placed therein about the axis B of the holder **140**.

The mixing motor **114** is activated to rotate the mixing blade **120** about the longitudinal axis A, thereby causing the consumable material to be mixed. The mixing blade may move reciprocally up and down within the cup **104**. As shown best in FIG. **16**B, the mixing blade **120**, positioned off-center relative to the cup **104**, is positioned close to the side **104***a* of the cup **104**. Advantageously, because the tilt angle θ of the cup-receiving holder **140** orients the tapered cup **104** placed therein such that the side **104***a* thereof extends generally parallel with the longitudinal axis A of the shaft **122**, the mixing blade **120** remains substantially equally close to the side **104***a* of the cup **104** throughout the reciprocal up and down movement of the mixing blade **120**. The cup **104** is also rotating about the axis B of the holder **140**. Advantageously therefore, during the mixing cycle, the mixing blade **120** reaches the consumable material proximate the perimeter of the cup **104** along substantially the entire circumference and height of the cup **104**, resulting in a more homogenous mix of the ingredients of the consumable material within the entirety of the cup **104**.

While the disclosure has been described with reference to specific embodiments thereof, it will be understood that numerous variations, modifications and additional embodiments are possible without departing from the broad inventive concept. It is understood, therefore, that this disclosure is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present disclosure as defined by the appended claims.

We claim:

1. An automated mix in-cup apparatus for mixing consumable material, the apparatus comprising:

a frame including a cup-holder to secure a tapered cup selectively placed therein, and a first motor operatively connected to the cup-holder to rotate the cup-holder;

a reciprocating carriage axially supported by the frame, the carriage supporting a second motor and a rotatable mixing blade to mix a consumable material, the mixing blade being secured to a shaft axially extending from the second motor, the shaft defining a longitudinal axis and the second motor configured to rotate the shaft and the mixing blade about the longitudinal axis;

wherein reciprocal movement of the carriage axially translates the mixing blade into and out of said tapered cup selectively placed in the cup-holder, and wherein the cup-holder and the first motor are oriented at an incline, the incline defining a tilt angle relative to the longitudinal axis of the shaft, whereby the shaft and the rotatable blade are positioned off-center relative to said tapered cup selectively placed in the cup-holder.

2. The apparatus of claim 1, wherein the inclined orientation of the cup-holder and the first motor orients said tapered cup selectively placed in the cup-holder such that a side of said tapered cup closest to the shaft extends generally parallel with the longitudinal axis of the shaft.

3. The apparatus of claim 1, wherein the tilt angle is between approximately 4° and approximately 8°.

4. The apparatus of claim 1, wherein the cup-holder defines a central axis and the first motor rotates the cup-holder about the central axis thereof.

5. The apparatus of claim 1, wherein the cup-holder comprises a base, at least two opposing clamping arms pivotably attached to the base and a generally central cam therebetween rotatably attached to the base, the cam being rotatable to pivot the clamping arms from a radially expanded position to a radially contracted clamping position.

6. The apparatus of claim 5, wherein the cup-holder is adjustably configured to securely receive different sized cups.

7. The apparatus of claim 5, wherein the cam is rotatably coupled to the first motor such that rotation of the first motor effectuates rotation of the cam to, in turn, pivot the clamping arms from the radially expanded position to the radially contracted position, the clamping arms radially contracting to secure said tapered cup therebetween.

8. The apparatus of claim 7, wherein the clamping arms are manually pivotable from the radially contracted position to the radially expanded position.

9. The apparatus of claim 1, wherein the reciprocating carriage further supports a splash shield above the cup-holder, the splash shield having at least one sidewall, a lid and an open bottom end.

10. The apparatus of claim 9, wherein the splash shield lid is substantially equally inclined to the incline of the cup-holder and the first motor, whereby the splash shield lid is engageable with said tapered cup selectively placed in the cup-holder.

* * * * *